

INSTRUCTION BOOK
FOR
RADIO TRANSMITTER BC-329-A
REMOTE CONTROL UNIT RM-6-A

MANUFACTURED BY
BENDIX RADIO CORPORATION
U.S.A.



RESTRICTED

PUBLISHED BY AUTHORITY
OF
THE CHIEF SIGNAL OFFICER
ORDER No. 14622-NY-37 DATE JUNE 30, 1937

58

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RADIO TRANSMITTER BC-329-A

REMOTE CONTROL UNIT RM-6-A

GENERAL DESCRIPTION OF COMPLETE EQUIPMENT

RADIO TRANSMITTER BC-329-A

The Radio Transmitter is designed for Airport Traffic Control Service operating within the frequency band of 200 to 410 kilocycles (1500 to 730 meters) and is capable of delivering not less than 25 watts of radio frequency energy into a suitable antenna system.

The transmitter is constructed in two units, each readily removable from the equipment cabinet for accessibility of inspection and repair.

Operation is provided for voice, continuous wave, or modulated continuous wave transmission, as desired. Provision is made for the use of one crystal of any frequency within the operating range of the transmitter. Power is obtained from a 50-60 cycle, single phase A.C. source at any voltage between 105 and 125 volts.

The transmitter is capable of complete modulation, thus making it possible to impart a maximum of signal energy to the carrier.

The power drain of the transmitter when operated in the "Stand-by Phone" position is approximately 150 watts, and when delivering full power output is approximately 500 watts.

RADIO FREQUENCY UNIT—(UPPER UNIT)

The Radio Frequency Unit contains all equipment including its associated power supply to produce the radio frequency energy required and transfer it to a suitable antenna system. This unit also contains the necessary keying circuits.

AUDIO FREQUENCY UNIT—(LOWER UNIT)

The Audio Frequency Unit contains the audio amplifier and power supply, required to raise the level of the microphone or MCW hummer, to a value sufficient to produce complete modulation of the carrier power developed in the power amplifier stage of the Radio Frequency Unit.

Provision is also made in this unit for the control circuits for starting and stopping the equipment and adjusting the filament voltages of the entire transmitter.

REMOTE CONTROL UNIT RM-6-A

The Remote Control Unit is designed for standard 19 inch relay rack mounting and occupies seven inches of rack space. All control circuits and equipment necessary for operating the Radio Transmitter from a remote point not exceeding $2\frac{1}{2}$ miles, are provided in this unit. A rectox type rectifier supplies power to operate the microphone or MCW hummer, and the power relays in the transmitter. A three position key switch enables changing quickly from PHONE to either CW or MCW transmission. Two pairs of connecting wires and a ground return are required between the Remote Control Unit and the Radio Transmitter.

MICROPHONE T-27-A

Microphone T-27-A is equipped with a suitable plug and "Press to Talk" switch for use in connection with the Remote Control Unit RM-6-A.

The weights of the principal components are as follows:

	Weight Lbs.
Radio Transmitter BC-329-A.....	420
Radio Frequency Unit (Upper Unit)....	165 Lbs.
Audio Frequency Unit (Lower Unit)....	130 Lbs.
Remote Control Unit RM-6-A.....	68
Microphone T-27-A.....	3

DETAILED DESCRIPTION OF PRINCIPAL COMPONENT PARTS

RADIO TRANSMITTER BC-329-A

Radio Transmitter BC-329-A is contained in an equipment cabinet with the apparatus mounted on two removable units. The upper unit contains the crystal oscillator, and two stages of radio frequency amplification. The speech input to the transmitter is amplified in three stages in the lower unit and then applied to the final radio frequency amplifier by means of an impedance matching transformer. The modulated radio frequency power from the power amplifier is transferred to the antenna by means of a suitable capacity coupling circuit.

Adequate protection is afforded the operating personnel. The panels are of the dead front type, and the apparatus mounted thereon is bakelite encased or grounded.

Opening the back door operates an interlock switch which functions to break the 105-125 volt A.C. line to the transmitter.

The functions of the various parts of the circuits of Radio Transmitter BC-329-A are outlined below. A schematic diagram of the radio transmitter and remote control unit is shown in Figure 11, and item numbers of component parts refer to this diagram.

FILAMENT SUPPLY CIRCUIT

Current for heating all vacuum tubes is obtained from three filament transformers (items 3, 4, and 111). Voltage is obtained from the A. C. supply through terminals 15 and 16, fuses (items 101, 102,) the door switch (item 143), the "Line Switch" (item 103), and relay (item 104) when operation is from the remote position, or through the relay contact shorting switch ("Master Switch," item 105) when testing at the transmitter position. Adjustment of voltage is obtained by "Filament Control" rheostat (item 106) and "Meter Control" switch (item 107), which allows measuring either line voltage or the voltage applied to the primaries of the filament transformers. This voltage should be set by means of the "Filament Control" at 100 volts. Fuses (items 1 and 2) are pro-

tection against overload in the filament circuits in the RF unit, and fuses (items 109, 110) provide similar protection in the audio unit.

PLATE SUPPLY CIRCUIT

Plate supply is obtained from two rectifiers, the one in the RF unit consisting of plate transformer (item 9), type 866 vacuum tubes (items 10 and 11), swinging choke (item 12), filter choke (item 13) and filter condensers (items 14 and 15). The voltage divider which supplies proper potentials for each of the vacuum tubes in the radio frequency circuits consists of resistors (items 16 to 21 inclusive).

The plate voltage for the audio unit is obtained from plate transformer (item 114) type 83 vacuum tube (item 115), swinging choke (item 116) filter choke (item 117), and filter condensers (items 118 and 119). The voltage divider consists of resistors (items 120, 121 and 123).

The circuit for supplying A.C. line voltage to the plate transformers includes the time-delay relay (item 5), and the plate start relay (item 6). The contacts on this relay are back connected so that the circuit is closed when the remote unit is not in operation. This provides control of starting the transmitter for tuning adjustments by means of the master switch on the transmitter without the use of the remote unit.

Fuses (items 7 and 8) provide protection for the radio frequency unit power supply and fuses (items 112 and 113) perform a similar function in the audio unit.

Taps on the plate transformers (items 9 and 114) are provided for adjusting the output of the high voltage rectifiers for varying A.C. line voltages from 105-125 volts in five volt steps.

These taps are designated near the connecting strips on the under side of each unit. The tap is factory set at 115 volts.

If the line voltage is consistently higher or lower than this value a change in tap is desirable. Carefully unsolder the connection between the black with red tracer wire and the terminal marked 115 V. and resolder to the terminal marked with the voltage nearest approximating the average line voltage encountered.

The same procedure should be followed in both the R.F. and Audio Units.

CRYSTAL OSCILLATOR CIRCUIT

A piezo electric quartz crystal oscillator (item 22) adjusted to a specified frequency and mounted in a standard Navy type air gap holder mounts in the oscillator compartment in the clips provided.

Plate inductance (item 30) and oscillator tuning condenser (item 31) provide the "Osc. Tuning" circuit which may be adjusted to a value suitable for the specified frequency. Plate and screen voltages for the type 59 oscillator tube (item 24) are obtained from the voltage divider through resistors (items 27 and 28).

Automatic bias is obtained across grid leak resistor (item 23) and a fixed initial bias which is helpful in obtaining rapid starting of low frequency crystals is secured across a resistor (item 25) which is by-passed with a condenser (item 26). Plate current is indicated on "Osc. Plate" meter (item 33).

INTERMEDIATE AMPLIFIER CIRCUIT

The intermediate amplifier serves to amplify the radio frequency voltage obtained from the crystal oscillator, and also as an isolation stage between it and the following circuits so that the frequency of the carrier wave will not vary with modulation.

The type 807 vacuum tube (item 38) obtains plate voltage of approximately 400 volts and screen voltage of approximately 225 volts from the voltage divider, and bias voltage across grid leak resistor (item 37) and cathode bias resistor (item 39).

The "Int. Amp. Tuning" consists of variometer (item 47) and condensers (items 48 and 49). Plate current is indicated on "Int. Amp. Plate" meter (item 52).

FINAL AMPLIFIER CIRCUIT

The type 830-B vacuum tube (item 58) serves as a modulating amplifier when the transmitter is used for telephone or MCW operation and as a power amplifier when used for CW telegraphy.

Excitation is obtained from the intermediate amplifier and neutralization is secured through condenser (item 63). Bias voltage is obtained across grid leak resistor (item 56) and bias resistor (item 61). The plate voltage is obtained through the secondary of the modulation transformer (item 142) and "Power Amp. Plate" meter (item 71). The "Power Amp. Tuning" circuit consists of tapped variometer (item 65), tuning condensers (items 66 to 69 inclusive), and the proper value of coupling capacity is selected by means of "Coupling" switch (item 83) and link switches connecting the fixed coupling condensers (items 80, 81 and 82).

ANTENNA CIRCUIT

The "Antenna Tuning" circuit consists of the tapped variometer (item 86), a series condensers (item 85) which may be shorted by means of a link switch, and "Antenna" meter (item 84). The constants of the variable inductance and fixed condensers are so proportioned that the antenna circuit may be resonated when used with antennae of widely varying characteristics. The series condenser should be shorted out except when the antenna is very long, that is, with an electrical length equivalent to greater than one quarter wave length.

SPEECH AMPLIFIER CIRCUIT

The audio output of the remote unit is connected at the transmitter through terminals 13 and 14 on the Audio Unit to the input transformer (item 125). The "Gain Control" (item 126) provides adjustment of the audio level applied to the first amplifier tube type 56 (item 127). Resistor (item 129), by-passed with condenser (item 131), provides bias for this tube. Resistor (item 128), and condenser (item 130), act as a filter to eliminate extraneous circuit noise. The coupling transformer (item 132), drives the type VT-45 (45) second amplifier tubes (items 133 and 134), which are connected in push-pull. Bias for these tubes is obtained across resistor (item 135) and by-pass condenser (item 136). The plate circuits of the first and second amplifier are by-passed by condensers (items 124 and 122). The second amplifier stage acts as a power drive for the four type 59 modulator tubes (items 138, 139, 140, 141) which are connected in push-pull parallel, and are operated at zero bias, class B. Output transformer

(item 142), serves as a coupling and impedance matching unit between the Class B modulator tubes and the RF power amplifier tube (item 58).

KEYING CIRCUIT

The keying circuit, consisting of relay (item 43) and current limiting resistor (item 41), obtains its voltage across resistor (item 42) which is in series with the bleeder circuit resistors. When the keying relay is open the intermediate amplifier tube is biased negatively to cut-off by the voltage across resistors (items 20 and 21), and the power amplifier tube (item 58) is biased negatively by the voltage built up across resistor (item 42) in series with resistor (item 44).

When the keying relay is closed either by means of the "Test Key" (item 45), the telegraph key, or certain contacts in the "MCW-PHONE-CW" selector switch these additional bias voltages are removed and the radio frequency circuit operates at normal power output.

When the keying relay is closed the current flowing through resistor (item 42) increases and the voltage built up across it tends to increase. To reduce this voltage and maintain suitable regulation, one of the contacts on the keying relay connects resistor (item 44) in parallel with resistor (item 42) when the relay is closed.

REMOTE CONTROL UNIT RM-6-A

Remote Control Unit RM-6-A contains a low voltage power supply suitable for supplying the microphone, MCW hummer, and control relays. It takes its power from a 50-60 cycle, single phase, 105-125 volt A.C. source, which is connected to terminals 5 and 6. Fuses (items 201 and 202) provide protection for the power transformer (item 204), and rectox rectifier unit (item 205). The secondary of the power transformer is tapped to allow adjustment of the output voltage as the rectox unit ages. The change in D.C. output is approximately 5 volts per tap.

The D.C. output of the rectifier is smoothed by the filter choke (item 206) and the high capacity, low voltage, electrolytic condenser (item 207).

The pilot lamp (item 208) is connected in series with the D.C. supply and a center-tap on the secondary of the microphone to line transformer (item 222). The voltage thus applied to the line produces a simplex circuit to ground which operates the relay (item 104), in the transmitter.

The resistor (item 209), furnishes a bleeder circuit for the power supply.

SELECTOR SWITCH "PHONE" POSITION

In the "Phone" position the selector switch performs the following functions:

1. It places a DC voltage on terminal 4 through the contacts of microphone relay (item 218), which causes the plate start relay (item 6,) to pull in opening the circuit to the plate supplies in the transmitter.
2. It connects terminal 3 to ground, which locks in the keying relay (item 43), as soon as the plate supplies are turned on.
3. It connects the microphone transformer (item 222), through the "Voice Gain" control (item 221) and blocking condenser (item 219), to the microphone jack (item 217).

The microphone obtains voltage through the retard coil (item 216) and the winding of the relay (item 218).

When Microphone T-27-A is plugged into the microphone jack and the "Press to Talk" switch is operated, current will flow thru the microphone and relay (item 218) will operate, opening its contacts and releasing the plate start relay (item 6).

This arrangement provides a "Stand-by" phone position in which the filaments of all tubes are lighted and the plate supplies are off. Operating the "Press to Talk" switch then provides immediate communication.

The neon tube (item 220) provides a means of absorbing the transient voltage which occurs when the microphone switch is opened.

SELECTOR SWITCH IN "MCW" POSITION

In the "MCW" position the selector switch performs the following functions:

1. It opens the circuit to terminal 4 releasing the plate start relay (item 6) placing the transmitter power supplies in operation.
2. It connects terminal 3 to ground which locks in keying relay (item 43).
3. It connects the microphone hummer (item 212) to the power supply through voltage divider resistors (items 210 and 211).
4. It connects the microphone transformer (item 222), through the MCW gain control (item 214) and blocking condenser (item 213) to the microphone hummer.
5. It connects the telegraph key jack (item 223) in the return circuit to the microphone transformer providing interruption of the tone as the telegraph key is operated.

SELECTOR SWITCH IN "CW" POSITION

In the "CW" position the selector switch performs the following functions:

1. It opens the circuit to terminal 4 releasing the plate start relay (item 6).
2. It shorts the primary of the microphone transformer (item 222), preventing unintentional modulation appearing on the carrier.
3. It connects the telegraph key jack (item 222) in series with terminal 3 to ground which provides control of the keying relay as the telegraph key is operated.

INSTALLATION

RADIO TRANSMITTER BC-329-A

Mount the transmitter on a solid table or other suitable support convenient to the antenna and ground leads. The transmitter should be securely bolted to the table using $\frac{1}{4}$ " lag or stove bolts and in some cases it would be desirable to secure the table to the floor in order to prevent the assembly from tipping forward as the units are withdrawn from the cabinet. Allow sufficient space behind the cabinet to permit the rear door to be opened.

The conduit fitting mounted in the bottom of the cabinet provides a means of entrance for the remote control lines and the 105-125 volt A.C. power wires.

To remove the units from the equipment cabinet in order to bolt the cabinet to the table and arrange for the conduit connections, proceed as follows:

1. Remove the inter-connecting cable between the top and bottom units, and remove the connec-

tions from the door switch at terminals 1 and 2 on the upper unit.

2. Remove the antenna connection at the inductance (item 86) in the upper unit.
3. Remove the ground connection at the terminal stud in the upper unit.
4. Remove all large screws around the outside edges of the front panels.
5. Pull forward on the upper unit using the handles provided. The unit will come only about half way out, locks being provided on the sides just above the angle slides to prevent rolling too far forward before provision is made to handle the weight of the unit.
6. With one person on each side of the unit release the locks by pressing downward on the levers and slide forward, supporting the under side of the unit at the front, until the two sets of front and back rollers on each side come together.
7. Lift the back of the unit so that the rear rollers are above the front rollers and the unit may be removed from the cabinet.
8. Repeat the operations indicated in paragraphs 5, 6, and 7, removing the lower unit from the cabinet.

Complete the mounting of the equipment cabinet and feed the external wires from the A.C. supply and remote control unit through the conduit unit through the conduit fitting.

Visually inspect the lower unit noticing the following points:

1. See that all fuses are in place, (items 101, 102, 109, 110, 112, 113).
2. See that resistors, items 120, 121, 135 on the top of the chassis, and items 123, 128, 129 under the chassis, are in position.
3. Check relay (item 104) and see that the contacts make properly.

Inspect the upper unit and check the following points:

1. See that all fuses are in place, (items 1, 2, 7 and 8).
2. See that all resistors are in their proper places.
3. Unscrew the metal shell dashpot of the time delay relay, (item 5), fill the shell two-thirds full (using the special oil provided), and replace it in position on the relay frame. Note the instructions appearing on the relay and if necessary, make the proper adjustments to cause operation in not less than 30 seconds, and not more than 45 seconds.
4. Check the other relays (items 6 and 43), and see that the contacts make properly.

Be sure the "Master Switch" and "Line Switch" are in the "Off" position. Also be sure Remote Control Unit RM-6-A is turned "Off."

Place the upper and lower units back in the cabinet, replace holding screws, antenna and ground connections, interconnecting cable, and door switch wires.

Connect external wires as shown in Figure 12.

REMOTE CONTROL UNIT RM-6-A

Mount Remote Control Unit RM-6-A in a convenient location on a standard relay rack. Remove the dust

cover and connect the A.C. supply wires and remote telephone lines to the terminals as shown in Fig. 10. Be sure fuses (items 201 and 202), are in place and pilot lamp bulb (item 208), is secure in its socket. Insert the neon bulb (item 220), in its socket.

A good ground must be connected to terminal 7, as the operation of the remote unit depends upon ground returns. For preliminary tests adjust the MCW gain control, (item 214), to approximately one-half of full rotation. In these preliminary tests be sure the "Line Switch" on the transmitter is OFF, otherwise operation of the remote unit will start the transmitter. Replace the dust cover and the remote unit is ready for operation.

PREPARATION FOR USE

Remove the back plate covering the Oscillator-Buffer section in the Radio Frequency Unit by pressing upward the thumb screws near the outer edges of the cover plate.

Place proper tubes in all sockets.

Place a quartz crystal of the proper operating frequency in position in the mounting clips provided within the oscillator compartment.

Adjust the tap on the Oscillator Plate Inductance, (item 30), to the terminal shown below for the desired frequency.

	Tap on Item 30
201 KC.....	Terminal Contact No. 1
219 KC.....	Terminal Contact No. 1
278 KC.....	Terminal Contact No. 2
396 KC.....	Terminal Contact No. 4

Replace the cover plate.

Adjust the tap on the power amplifier plate inductance, (item 65), as indicated below for the operating frequency.

	Tap on Item 65
201 KC.....	Terminal Contact No. 1
219 KC.....	Terminal Contact No. 1
278 KC.....	Terminal Contact No. 2
396 KC.....	Terminal Contact No. 3

Include in the circuit the proper power amplifier plate tuning condensers as shown below.

201 KC.....	Items 69, 68	(.004 mfd.)
219 KC.....	Items 69, 67, 66	(.0035 mfd.)
278 KC.....	Items 69, 66	(.0025 mfd.)
396 KC.....	Item 69	(.002 mfd.)

OPERATION

PRELIMINARY ADJUSTMENTS

Preliminary adjustment of the transmitter should be made as follows:

With the remote control power switch in the OFF position, the selector switch set in the CW position, and the "Filament Control" set at 1, operate the "Line Switch" and the "Master Switch." Place the "Meter Control" switch in the filament position and adjust the "Filament Control" so that the "AC VOLTS" meter, (item 108) indicates 100 volts. In approximately 30 to 45 seconds after the "Master Switch" is operated the time-delay relay, (item 5) will close, which functions to close the circuit to the plate transformers of the radio frequency power supply and the audio power supply.

With the "Test Key" in the neutral or center position, rotate the "Osc. Tuning" dial slowly from zero toward 100. The "Osc. Plate" current should decrease and then jump sharply as the dial is rotated toward 100°. The point where this sharp rise in current occurs is the point at which the oscillator stops oscillating. This point will be found more critical at higher operating frequencies. Set the dial at approximately one half the distance from zero to the point on the dial at which this sharp rise in current occurs.

Momentarily depress the "Test Key." Adjust the "Int. Amp. Tuning" dial to indicate a minimum of current as read on the "Int. Amp. Plate" meter. The approximate dial settings for the "Int. Amp. Tuning" dial are given below:

	Approx. Dial Reading
201 KC.....	97
219 KC.....	75
278 KC.....	42
396 KC.....	10

Adjust the "Power Amp. Tuning" dial to read a minimum on the "Power Amp. Plate" meter. Care should be exercised not to hold the "Test Key" down for more than a few seconds if the plate current as read on the "Power Amplifier Plate" meter exceeds 100 milliamperes. Once the point of minimum plate current for the final amplifier tube is determined approximately a little experience will make it possible to complete this adjustment very rapidly.

The adjustments of the "Antenna Tuning" and antenna "Coupling" depend to a great extent upon the characteristics of the antenna and ground system to be used. The following table indicates the proper adjustment of the antenna loading inductance (item 86), and the coupling capacity (items 73 to 82) when the antenna has an equivalent resistance of 8 ohms and an effective capacity of 500 MMF.

	Tap on Item	Added Coupling Condensers, Items	Coupling Items
	86	80, 81, 82	73-79
201 KC	1	Items 80, 81 (.06 mfd.)	5
219 KC	2	Item 80 (.03 mfd.)	1
278 KC	3	Item 80 (.03 mfd.)	4
396 KC	4	None	6

In general, with an antenna approximately 200 feet in length, the effective resistance will increase with the frequency within the range of 200—410 KC. The antenna will also more nearly approach an electrical length of a quarter wavelength. For these reasons, when operating on the higher frequencies it will probably be necessary to connect fewer turns, than specified in the above table, in the antenna loading inductance (item 86), in order to secure resonance, and to use less coupling capacity in items 73 to 82 than the values indicated.

Depress the test key and rotate the "Antenna Tuning" dial to obtain a maximum of "Antenna" current. If the antenna current reaches a maximum at zero on the dial, it will be necessary to decrease the number of turns included in the antenna loading coil, (item 86). If the antenna current reaches a maximum at 100 on the dial, increase the number of turns in use in the loading coil.

Retune the "Power Amp. Tuning" dial to minimum plate current as read on the "Power Amp. Plate" meter. This current should read from 80 to 95 milli-

amperes. If the current is too high, additional capacity is required in the coupling condensers and the switch marked "Coupling" should be rotated counter-clockwise one or more points. If the current is too low the switch should be rotated one or more points in the clockwise direction. After each change in "Coupling" adjustment, retune the "Antenna Tuning" dial to maximum antenna current and the "Power Amp. Tuning" dial to minimum plate current.

If the plate current is still too high with the "Coupling" switch at the lowest setting, additional capacity is required and one or more of the fixed coupling condensers, (items 80, 81, and 82), should be included in the circuit by means of the link switches provided for that purpose.

If the plate current is still too low with the coupling at maximum, less coupling capacity is required and one or more of the fixed coupling condensers should be removed from the circuit by means of the link switches.

The table below indicates typical meter readings under normal operating conditions:

TYPICAL METER READINGS

Osc. Plate.....	10—20 M.A.
Int. Amp. Plate.....	50—70 M.A.
Power Amp. Plate.....	80—95 M.A.
Antenna	1.77—1.90 Amps.
A.C. Volts—Line.....	105—125 Volts.
A.C. Volts—Fil.....	100 Volts.

These limits are for an antenna having an effective resistance of 8 ohms.

When a satisfactory adjustment has been secured, turn the transmitter off by means of the "Master Switch." Place the test key in the "up" or locking position. Operate the "Master Switch" and after the 30 to 45 seconds required for the time delay relay to function, the transmitter should start and normal plate current and antenna current should be obtained. If the quartz crystal does not start readily under these conditions, adjust the "Osc. Tuning" dial toward zero by a few divisions. Operate the "Master Switch" to the "Off" position and then again to the "On" position. This procedure should be repeated until reliable starting of the quartz oscillator is assured.

Adjust the "Gain Control" to approximately a scale reading of 8 and operate the "Master Switch" to the "Off" position. Return the "Test Key" to center position. The transmitter is now ready for operation from the remote control unit.

OPERATION FROM THE REMOTE POSITION.

The "Line Switch" must be "On" or the transmitter cannot be operated from the remote position.

When the power switch on the remote control unit is operated, the pilot lamp will glow. This lamp is so connected in the circuit that it offers protection for the remote control power supply in case of a short circuit of the telephone line to ground, in which case the pilot lamp will burn out. The brilliance of this lamp is also an indication of an open circuit in the telephone line in which case the lamp will glow very dimly and the transmitter will not operate.

With the three position selector key on the remote unit in the "Phone" position turn on the power switch.

This will operate filament relay, (item 104) in the transmitter and also the plate supply relay, (item 6), which serves to cut off the plate supplies in the transmitter. This is the "Stand-By" position. When the "Press-to-Talk" switch on Microphone T-27-A is operated, the plate supply relay will release placing the transmitter in an operating condition. With the "Voice Gain" control set at approximately 7 or 8, speak directly into the microphone in a normal tone of voice. This should produce approximately complete modulation of the carrier power.

Place the selector key in the "MCW" position which automatically turns on the transmitter, starts the microphone hummer and connects the telegraph key into the circuit. Pressing the telegraph key will now produce a signal modulated at approximately 1000 cycles. A gain control (item 214), for adjusting the level of the modulating tone is provided on the rear terminal panel of the remote unit. This control is independent of the "Voice Gain" control on the front of the panel, and each should be set to produce a satisfactory signal without over-modulating the transmitter. The overall gain of the audio unit in the transmitter may be adjusted by means of the "Gain Control" on the front of the transmitter panel to compensate for losses in the telephone line.

Place the selector key in the "CW" position which turns on the plate supplies, starts the crystal oscillator and connects the telegraph key in the circuit in such a manner as to provide operation of the keying relay (item 43), when the telegraph key is depressed.

OPERATION INTO 500 OHM TRANSMISSION LINE

In some few cases it may be desired to operate the transmitter into a 500 ohm radio frequency transmission line with an antenna coupling unit and antenna system remote from the transmitter installation.

Adjustments of the transmitter for this condition are somewhat more critical, particularly in the selection of the proper coupling condenser value.

The correct adjustments may most easily be made by first making use of a 500 ohm non-inductive resistor capable of dissipating 50 watts of power, connected in series with a 0.5 Amp. thermocouple meter across the "Antenna" and "Ground" terminals of the transmitter. This resistor will act as an artificial line and the transmitter may be adjusted to proper operating conditions and then, when the transmission line is substituted for the resistor, improper adjustments of the antenna tuning unit will be more readily recognized.

In tuning the transmitter using the 500 ohm resistor proceed as follows:

1. Connect tap on antenna loading inductance (item 86), to remove the coil from the circuit.
2. Be sure the link switch shorts out the series antenna condenser (item 85).
3. Remove all additional coupling condensers (Items 80, 81, 82) by means of the link switches provided.
4. Connect tap on item 65 and select tuning condensers (items 66, 67, 68, 69), as set forth under "Preparation for Use," page 5.
5. Operate transmitter, and check meter readings. The "Power Amp. Plate" current should be 80—95 M.A. and the line current, as read on the

0.5 Amp. meter should range from .23—.3 amperes under normal conditions.

6. A change of one point in the setting of the "Coupling" Switch will result in considerable change in "Power Amp. Plate" current. At the higher frequencies it may be found desirable to use the entire tuning coil (item 65), rather than making the tap adjustment as shown on page 9, and make use of a lower capacity value of tuning condenser (items 66, 67, 68, 69), suitable to secure resonance at the operating frequency.
7. When the proper "Power Amp. Plate" current has been secured the 500 ohm resistor may be disconnected and the transmitter is ready for operation into the 500 Ohm transmission line.

MAINTENANCE

ROUTINE TESTS

A routine inspection should be made at regular intervals. In the following operations concerned with servicing the equipment inside the equipment cabinet, be sure there is no voltage on the apparatus at this time. Shut down the equipment completely for these operations by disconnecting the A.C. power source to the transmitter.

Wipe dust and dirt from exposed apparatus. Inspect all relays, clean the contacts and make adjustments as necessary.

In locating trouble in the equipment the time required to find the cause will be reduced to a minimum if a systematic procedure of testing is employed. In most cases it is possible to immediately locate the trouble in some one portion of the equipment by observing the meter readings in the various circuits and comparing them with normal meter readings.

The table below lists the approximate normal voltages that should be observed in various portions of the transmitter circuits. Reference to these values will be of considerable aid in rapidly locating the source of trouble.

	Filament Voltages	Voltages Measured to Ground		
		Plate	Screen	Cathode
Oscillator,				
Type 59.....	2.5	225	100	4.5
Int. Amp.,				
Type 807.....	6.3	400	225	25
Power Amp.,				
Type 830-B.....	10.0	850	...	45
Speech Amp.,				
Type 56.....	2.5	230	...	12.5
Audio Driver,				
2 Signal Corps.				
type VT-45.....	2.5	315	...	55
Modulator,				
4 Type 59.....	2.5	400	...	0

FAILURE OF ANTENNA CURRENT

If the transmitter appears to be operating normally and a definite minimum plate current can be secured as indicated on the "Power Amp. Plate" meter, and there is no current indicated by the "Antenna" meter it may

be due to an open ground or untuned antenna circuit, or a short circuit of the antenna coupling condensers (items 73 to 83 inclusive). Reduced antenna current may be caused by connections in the antenna or ground leads having corroded, introducing a high resistance.

FAILURE IN REMOTE UNIT

When the transmitter operates in a proper manner when controlled from the local position, but fails to start from the remote unit, a check should be made of the voltage appearing across terminal 13 or 14 to ground on the back of the audio unit in the transmitter with the remote unit turned on. This voltage should range between 24 and 32 volts. If this voltage is low, check the voltage appearing from terminals 1 or 2 to ground on the terminal panel of the remote control unit. This voltage should range from 28 to 36 volts. If the proper voltage appears here but not at the transmitter terminals 13 or 14, the control line is open circuited. A short circuit of low resistance in this control line will cause the pilot light, (item 308) to burn out.

As the rectox unit, (item 205), ages the voltage produced will gradually decrease. When this occurs it may be necessary to alter the position of the tap on the

power transformer (item 204), to a higher numbered terminal thus increasing the A.C. voltage applied to the rectox unit. It is, however undesirable to operate the remote unit with a voltage of greater than 40 volts appearing across terminal 4 to ground on the remote unit when the transmitter is turned on, the selector key in the "Phone" position and with the "Press-to-Talk" switch not operated.

When operating in the telephone "Stand-By" position, failure of the transmitter plate supplies to cut off with release of the "Press-to-Talk" switch on the microphone may be caused by an open circuit in the control line from terminal 4 on the remote to terminal 4 on the transmitter.

Excessive hum on the carrier when operating from the remote position may be caused by a failure in filter condenser (item 207) or an unbalance in the voice lines from terminals 1 and 2 on the remote unit to terminals 13 and 14 on the transmitter. This may be caused either by a low resistance leak to ground on one of the telephone lines or by a failure in either the microphone transformer (item 222), or the input transformer (item 125).

REFERENCE LIST

UNITS AND PARTS OF UNITS

RADIO TRANSMITTER BC-329-A AND ASSOCIATED EQUIPMENT

Reference	Name or Function	Description	Manufacturer	Mfrs. Type No.	Bendix Drg. Ref
R.F. UNIT					
1	R.F. Unit Fil. Fuse	6 Amp., 250 Volts	N.E.C. Std.	2" Long, 3/16" Ferrules	B-7587-6
2	R.F. Unit Fil. Fuse	6 Amp., 250 Volts	N.E.C. Std.	2" Long, 3/16" Ferrules	B-7587-6
3	Fil. Transformer	10 Volt, 6.3 Volt, 2.5 Volt, 100 Volt Primary	Standard Transformer Corp.	P-5107	B-4889
4	Fil. Transformer	2.5 Volts, 10 Amps., 100 Volt Primary	Standard Transformer Corp.	P-5108	B-4886
5	Time Delay Relay	30—45 Sec. Delay	Square D. Co.	EQ-567	B-7118
6	Plate Start Relay	Midget R.F. Relay	Ward Leonard Elec. Co.	Similar to 507 —532 except 32 V. D.C. Coil 690 Ohms	B-4955
7	R.F. Unit Plate Fuse	6 Amp., 250 Volts	N.E.C. Std.	2" Long, 3/16" Ferrules	B-7587-6
8	R.F. Unit Plate Fuse	6 Amp., 250 Volts	N.E.C. Std.	2" Long, 3/16" Ferrules	B-7587-6
9	Plate Transformer	800-0-800 Volt, 275 M.A., 105-125 Volt Tapped Primary	Standard Transformer Corp.	P-5109	B-4881
10	Socket for 866 Tube	4 Prong Ceramic Socket	National Co.		B-4223-1
11	Socket for 866 Tube	4 Prong Ceramic Socket	National Co.		B-4223-1
12	Swinging Choke	275 M.A.	Standard Transformer Corp.	C-1930	B-4888
13	Filter Choke	275 M.A.	Standard Transformer Corp.	C-1929	B-4887
14	Filter Condenser	4 mfd., 1500 Volt	Cornell-Dubilier Corp.	TJ-15040	B-3074
15	Filter Condenser	4 mfd., 1500 Volt	Cornell-Dubilier Corp.	TJ-15040	B-3074
16	Voltage Divider Resistor	900 Ohms, 115 Watts	Ward Leonard Elec. Co.	D, with ferrule ends	B-7111-1
17	Voltage Divider Resistor	900 Ohms, 115 Watts	Ward Leonard Elec. Co.	D, with ferrule end	B-7111-1
18	Voltage Divider Resistor	900 Ohms, 115 Watts	Ward Leonard Elec. Co.	D, with ferrule ends	B-7111-1
19	Voltage Divider Resistor	1500 Ohms, 115 Watts	Ward Leonard Elec. Co.	D, with ferrule ends	B-7111-2
20	Voltage Divider Resistor	1750 Ohms, 80 Watts	Ward Leonard Elec. Co.	B, with ferrule ends	B-7110-1
21	Voltage Divider Resistor	1750 Ohms, 80 Watts	Ward Leonard Elec. Co.	B, with ferrule ends	B-7110-1
22	Quartz Crystal	Mounted in Navy Type Isolantite Holder	Bendix Radio Corp.	MX-3A	AA-2014-A
23	Osc. Grid Resistor	250,000 Ohms, 2 Watts	International Resistance Co.	250M-F2	B-7128-50F
24	Socket for 59 Tube	Large 7 Prong Ceramic Socket	National Co.		B-4223-5

Reference	Name or Function	Description	Manufacturer	Mfrs. Type No.	Bendix Drg. Ref
25	Osc. Bias Resistor	400 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-2A
26	RF By-pass Cond.	.05 mfd., 600 Volts	Cornell-Dubilier Corp.	9-11050	B435-2F
27	Osc. Voltage Divider	15,000 Ohms, 10 Watts	Ohmite Mfg. Co.	Brown Devil	B-410-58
28	Osc. Voltage Divider	15,000 Ohms, 10 Watts	Ohmite Mfg. Co.	Brown Devil	B-410-58
29	RF By-pass Condenser	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-437-3F
30	Osc. Plate Inductance	220 Turns, 10-38 Litz	Bendix Radio Corp.		AB-8175
31	Osc. Tuning Condenser	220 mfd.	Cardwell Mfg. Corp.	XT-220PS	B-3213
32	R.F. By-pass Condenser	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-437-3F
33	Osc. Plate Meter	0-100 M.A. D.C.	Weston Electrical Instrument Corp.	301 Rect. Flush Bakelite	B-4438
34	Meter By-pass Cond.	.01 mfd., 1,000 Volts	Cornell-Dubilier Corp.	4-6S1	B-7059-15
35	R.F. Input Condenser	.001 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22010	B-436-6F
36	R.F. Choke Coil	250 M.H., 60 M.A.	Hammarlund Mfg. Co.	RFC-250	B-4947
37	Int. Amp. Grid Resistor	20,000 Ohms, 2 Watts	International Resistance Co.	20M-F2	B-7128-35F
38	Socket for 807 Tube	5 Prong Ceramic Socket	National Co.		B-4223-2
39	Int. Amp. Bias Resis.	400 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-2
40	R.F. By-pass Condenser	.05 mfd., 600 Volts	Cornell-Dubilier Corp.	9-11050	B-435-2F
41	Current Limiting Resistor	10,000 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-5
42	Voltage Divider Resistor	400 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-2
43	Keying Relay	32 Volts, 1300 Ohms, 2 Make Contacts	Automatic Electric Co.	AQA, 970-A-2	B-4953
44	Voltage Regulating Resistor	200 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-1
45	Test Key	1 Make Locking, 1 Make Non-locking	Automatic Electric Co.	D321, 308	B-7648
46	R.F. By-pass Cond.	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-437-3F
47	Int. Amp. Plate Inductance	Variometer	Bendix Radio Corp.	AF6632-A	P-6850
48	Int. Amp. Tuning Condenser	.004 mfd., 3000 Volts	Cornell-Dubilier Corp.	PL-184-6	B-3106-19E
49	Int. Amp. Tuning Condenser	.004 mfd., 3000 Volts	Cornell-Dubilier Corp.	PL-184-6	B-3106-19E
50	R.F. Choke Coil	100 M.A.	Bendix Radio Corp.		AB-9953
51	R.F. By-pass Cond.	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-437-3F
52	Int. Amp. Plate Meter	0-200 M.A. D.C.	Weston Electrical Instrument Corp.	301 Rect. Flush Bakelite	B-3512-2
53	Meter By-pass Cond.	.01 mfd., 1000 Volts	Cornell-Dubilier Corp.	4-6S1	B-7059-15
54	R.F. Input Cond.	.002 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22020	B436-9F

Reference	Name or Function	Description	Manufacturer	Mfrs. Type No.	Bendix Drg. Ref.
55	R.F. Choke Coil	250 M.H., 60 M.A.	Hammarlund Mfg. Co.	RFC-250	B-4947
56	Power Amp. Grid Resistor	2000 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-6
57	R.F. By-pass Cond.	.05 mfd., 600 Volts	Cornell-Dubilier Corp.	9-11050	B-435-2F
58	Socket for 830-B Tube	4 Prong Ceramic Socket	National Co.		B-4223-1
59	R.F. By-pass Cond.	.05 mfd., 600 Volts	Cornell-Dubilier Corp.	9-11050	B-435-2F
60	R.F. By-pass Cond.	.05 mfd., 600 Volts	Cornell-Dubilier Corp.	9-11050	B-435-2F
61	Power Amp. Bias Resistor	400 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-2
62	Audio By-pass Cond.	.5 mfd., 330 V. A.C.	Cornell-Dubilier Corp.	KG-3050	B-4559-6
63	Neutralizing Cond.	30 mfd.	Cardwell Mfg. Corp.	ZT-30-AS	B-3196
64	Plate Blocking Cond.	.01 mfd., 2500 Volts	Cornell-Dubilier Corp.	9-51010	B-439-2F
65	Power Amp. Plate Inductance	Tapped Variometer	Bendix Radio Corp.		AF-8523
66	Power Amp. Tuning Condenser	.002 mfd., 6000 Volts	Cornell-Dubilier Corp.	PL-217-6	B-3106-14E
67	Power Amp. Tuning Condenser	.002 mfd., 6000 Volts	Cornell-Dubilier Corp.	PL-217-6	B-3106-14E
68	Power Amp. Tuning Condenser	.001 mfd., 5000 Volts	Cornell-Dubilier Corp.	PL-246-6	B-3106-11E
69	Power Amp. Tuning Condenser	.0005 mfd., 5000 Volts	Cornell-Dubilier Corp.	PL-272-6	B-3106-8E
70	RF Choke Coil	120 MA.	Bendix Radio Corp.		B-8665-A
71	Power Amp. Plate Meter	0-200 M.A. D.C.	Weston Electrical Instrument Corp.	301 Rect. Flush Bakelite	B-3512-2
72	Meter By-pass Cond.	.01 mfd., 1000 Volts	Cornell-Dubilier Corp.	4-6S1	B-7059-15
73	Coupling Condenser	.005 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22050	B-436-11F
74	Coupling Condenser	.005 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22050	B-436-11F
75	Coupling Condenser	.003 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22030	B-436-9F
76	Coupling Condenser	.004 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22040	B-436-10F
77	Coupling Condenser	.005 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22050	B-436-11F
78	Coupling Condenser	.008 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-22080	B-436-13F
79	Coupling Condenser	.01 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21010	B-436-14F
80	Coupling Condenser	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-436-3F
81	Coupling Condenser	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-436-3F
82	Coupling Condenser	.03 mfd., 1200 Volts	Cornell-Dubilier Corp.	9-21030	B-436-3F
83	Coupling Switch	6 Point Ceramic Switch	Yaxley Mfg. Div. of R. R. Mallory Co.	Special	B-9344
84	Antenna Ammeter	0-2.5 Amps. R.F.	Weston Electrical Instrument Corp.	425 Rect. Flush Bakelite	B-4857
85	Antenna Condenser	.001 mfd., 5000 Volts	Cornell-Dubilier Corp.	PL-246-6	B-3106-11E
86	Antenna Loading Inductance	Tapped Variometer	Bendix Radio Corp.		AF-9648
87	Static Leak Resistor	.1 Megohms, 2 Watts	International Resistance	.1 Meg. BT-2	B-382-46
88	Osc. Tuning Dial	4 inch Dial and Pointer	General Radio Co.	717-A	B-7117

Reference	Name or Function	Description	Manufacturer	Mfrs. Type No.	Bendix Drg. Ref.
89	Int. Amp. Tuning Dial	4 inch Dial and Pointer	General Radio Co.	717-A	B-7117
90	Power Amp. Tuning Dial	4 inch Dial and Pointer	General Radio Co.	717-A	B-7117
91	Antenna Tuning Dial	4 inch Dial and Pointer	General Radio Co.	717-A	B-7117
92	Coupling Tuning Knob	Skirt Knob	General Radio Co.	637-J	B-428-1
93	Dial Lock Assembly	4 Used	Bendix Radio Corp.		AB-8696

AUDIO UNIT

101	Line Fuse	10 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-10
102	Line Fuse	10 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-10
103	Line Switch	D.P.S.T. Switch	Arrow-Hart & Hegeman Co.	8931 except back connected	B-7120
104	Power Control Relay	Midget Relay	Ward Leonard Elec. Co.	106-541	B-4956
105	Master Switch	D.P.S.T. Switch	Arrow-Hart & Hegeman Co.	8931 except back connected	B-7120
106	Filament Rheostat	25 Ohms, 150 Watts	Ward Leonard Elec. Co.	1108 with $1\frac{15}{16}$ " shaft length	B-7113
107	Meter Switch	2 Point Ceramic Switch	Yaxley Mfg. Div. of P. R. Mallory Co.	Special	QB-9528
108	A.C. Voltmeter	0-150 Volts A.C.	Weston Electrical Instrument Corp.	476, Rect. Flush Bakelite	B-4858
109	Audio Fil. Fuse	6 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-6
110	Audio Fil. Fuse	6 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-6
111	Fil. Transformer	2.5 Volt, 2.5 Volt, 5 Volt, 100 Volt Primary	Standard Transformer Corp.	P-5106	B-4890
112	Audio Plate Fuse	6 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-6
113	Audio Plate Fuse	6 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-6
114	Plate Transformer	400-0-400 Volts, 250 MA., 105-125 Volt Tap Primary	Standard Transformer Corp.	P-5105	B-4885
115	Socket for 83 Tube	4 Prong Ceramic Socket	National Co.		B-4223-1
116	Swinging Choke	250 M.A.	Standard Transformer Corp.	C-1928	B-4884
117	Filter Choke	250 M.A.	Standard Transformer Corp.	C-1927	B-4883
118	Filter Condenser	4 mfd., 1000 Volts	Cornell-Dubilier Corp.	TJ-10040	B-3068
119	Filter Condenser	4 mfd., 1000 Volts	Cornell-Dubilier Corp.	TJ-10040	B-3068
120	Voltage Divider Resistor	800 Ohms, 45 Watts	Ward Leonard Elec. Co.	T, with ferrule ends	B-7112-1
121	Voltage Divider Resistor	15,000 Ohms, 33 Watts	Ward Leonard Elec. Co.	D, with ferrule ends	B-7111-3
122	Audio By-pass Cond.	4 mfd., 600 Volts	Cornell-Dubilier Corp.	TJ-6040	B-3065

Reference	Name or Function	Description	Manufacturer	Mfrs. Type No.	Bendix Drg. Ref.
123	Plate Dropping Resistor	20,000 Ohms, 2 Watts	International Resistance Co.	20M-F2	B-7128-35F
124	Audio By-pass Condenser	4 mfd., 600 Volts	Cornell-Dubilier Corp.	TJ-6040	B-3065
125	Input Transformer	500 Ohms to Grid	Standard Transformer Corp.	A-4874	B-4880
126	Gain Control	100,000 Ohm Pot.	Centralab Co.	72-122	B-7115
127	Socket for 56 Tube	5 Prong Ceramic Socket	National Co.		B-4223-2
128	Audio Grid Resistor	50,000 Ohms, 2 Watts	International Resistance Corp.	50M-F2	B-7128-41F
129	Bias Resistor	2,500 Ohms, 2 Watts	International Resistance Co.	2500-F2	B-7128-19F
130	Audio By-pass Cond.	5 mfd., 330 V. A.C.	Cornell-Dubilier Corp.	KG-3050	B-4559-6
131	Bias By-pass Cond.	5 mfd., 330 V. A.C.	Cornell-Dubilier Corp.	KG-3050	B-4559-6
132	Audio Transformer	Plate to push-pull Grids	Standard Transformer Corp.	A-4873	B-4891
133	Socket for VT-45 Tube	4 Prong Ceramic Socket	National Co.		B-4223-1
134	Socket for VT-45 Tube	4 Prong Ceramic Socket	National Co.		B-4223-1
135	Bias Resistor	800 Ohms, 25 Watts	Ward Leonard Elec. Co.	A, with ferrule ends	B-7109-3
136	Bias By-pass Cond.	5 mfd., 330 V. A.C.	Cornell-Dubilier Corp.	KG-3050	B-4559-6
137	Driver Transformer	Push-pull Parallel 59 Tubes	Standard Transformer Corp.	A-4872	B-4879
138	Socket for 59 Tube	Large 7 Prong Ceramic Socket	National Co.		B-4223-5
139	Socket for 59 Tube	Large 7 Prong Ceramic Socket	National Co.		B-4223-5
140	Socket for 59 Tube	Large 7 Prong Ceramic Socket	National Co.		B-4223-5
141	Socket for 59 Tube	Large 7 Prong Ceramic Socket	National Co.		B-4223-5
142	Modulation Transformer	4-59 Tubes to 830-B	Standard Transformer Co.	A-5323	B-4882
143	Door Switch	S.P. S.T. Switch	Arrow-Hart & Hegeman Co.	2023	B-7121
144	Meter Switch Knob	Skirt Knob	General Radio Co.	637-J	B-428-1
145	Filament Control Knob	Skirt Knob	General Radio Co.	637-J	B-428-1
146	Gain Control Knob	Skirt Knob	General Radio Co.	637-J	B-428-1

REMOTE CONTROL UNIT RM-6-A

201	Line Fuse	6 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-6
202	Line Fuse	6 Amps., 250 Volts	N.E.C. Std.	2" Long, $\frac{9}{16}$ " Ferrules	B-7587-6
203	Power Switch	D.P.S.T. Toggle Switch	Arrow-Hart & Hegeman Co.	20902— $\frac{3}{8}$ " Shank	B-421-2
204	Power Transformer	115 Volt Primary Tapped Secondary	Standard Transformer Corp.	P-5204	B-7331

Reference	Name or Function	Description	Manufacturer	Mfrs. Type No.	Bendix Drg. Ref.
205	Rectox Rectifier	50 Volts, 250 M.A.	Westinghouse Mfg. Co.	966-698	B-4948
206	Filter Choke	250 M.A.	Standard Transformer Corp.	C-1953	B-7332
207	Filter Condenser	500 Mfd., 50 Volts	Cornell-Dubilier Corp.	EVL-5005	B-7116
208	Pilot Lamp Socket	Miniature Screw Base	Yaxley Mfg. Div. of P. R. Mallory Co.	310-R	B-3715-R
209	Voltage Divider Resistor	400 Ohms, 10 Watts	Ohmite Mfg. Co.	Brown Devil	B-410-25
210	Voltage Divider Resistor	300 Ohms, 10 Watts	Ohmite Mfg. Co.	Brown Devil	B-410-23
211	Voltage Divider Resistor	100 Ohms, 10 Watts	Ohmite Mfg. Co.	Brown Devil	B-410-17
212	Microphone Hummer	4.5 Volts	General Radio Co.	572-B	B-4859
213	Blocking Condenser	1 mfd., 400 Volts	Cornell-Dubilier Corp.	DHR-4100	B-3317-F
214	MCW Gain Control	200 Ohm L Pad	Centralab Co.	Special	B-7114
215	Selector Switch	3 Position Key Switch	Automatic Elec. Co.	Z-321, 672 Modified	B-4954-A
216	Microphone Impedance	60 M.A.	Standard Transformer Co.	C-1954	B-7333
217	Microphone Jack		Western Electric Co.	246-E	B-1057-3
218	Microphone Relay	20 Ohm Coil, single break contacts	Automatic Elect. Co.	ZR-30-0266	
219	Blocking Condenser	4 mfd., 600 Volts	General Electric Co.	9CE5A24	B-2400
220	Socket for Neon Bulb	4 Prong Ceramic Socket	National Co.		B-4223-1
221	Voice Gain Control	200 Ohm L Pad	Centralab Co.	Special	B-7114
222	Microphone Transformer	Microphone to 500 Ohm Line	Standard Transformer Co.	A-4884	B-7334
223	Key Jack		Western Electric Co.	221-E	B-4943
224	Voice Gain Knob	Skirt Knob	General Radio Co.	637-J	B-428-1
225	MCW Gain Knob	Pointer Knob	General Radio Co.	637-A	B-425-1
T-27-A	Microphone		Western Electric Co.	1120-DA	B-4944

VACUUM TUBES

Reference	Name or Function	Location	Manufacturer	Mfrs. Type	Signal Corps. No.
10T	Rectifier	Socket Item 10	R.C.A.	866	VT-46-A
11T	Rectifier	Socket Item 11	R.C.A.	866	VT-46-A
24T	Osc. Tube	Socket Item 24	R.C.A.	59	
38T	Int. Amp. Tube	Socket Item 38	R.C.A.	807	
58T	Power Amp. Tube	Socket Item 58	R.C.A.	830-B	
115T	Rectifier	Socket Item 115	R.C.A.	83	
127T	Amplifier	Socket Item 127	R.C.A.	56	VT-56
133T	Amplifier	Socket Item 133	R.C.A.	45	VT-45
134T	Amplifier	Socket Item 134	R.C.A.	45	VT-45
138T	Modulator	Socket Item 138	R.C.A.	59	

Reference	Name or Function	Location	Manufacturer	Mfrs. Type	Signal Corps. No.
139T	Modulator	Socket Item 139	R.C.A.	59	
140T	Modulator	Socket Item 140	R.C.A.	59	
141T	Modulator	Socket Item 141	R.C.A.	59	
208T	Pilot Lamp	Socket Item 208	General Electric Co.	Mazda No. 40	LM-25
220T	Neon Bulb	Socket Item 220	General Electric Co.		S-14, 2 Watt 4 prong base less resistor

LIST OF ITEMS WHICH ARE IDENTICAL AND INTERCHANGEABLE

Reference	Description
1, 2, 7, 8, 109, 110, 112, 113.....	Fuse, 6 Amps., 250 Volts.
10, 11, 58, 115, 133, 134, 220.....	Socket, 4 Prong Ceramic.
14, 15.....	Condenser, 4 mfd., 1500 Volts.
16, 17, 18.....	Resistor, 900 Ohms, 115 Volts.
20, 21.....	Resistor, 1750 Ohms, 80 Watts.
25, 39, 42, 61.....	Resistor, 400 Ohms, 25 Watts.
26, 40, 57, 59, 60.....	Condenser, .05 mfd., 600 Volts..
24, 138, 139, 140, 141.....	Socket, Large 7 Prong Ceramic.
27, 28.....	Resistor, 15,000 Ohms, 10 Watts.
29, 32, 46, 51, 80, 81, 82.....	Condenser, .03 mfd., 1200 Volts.
34, 53, 72.....	Condenser, .01 mfd., 1000 Volt Test
36, 55.....	Choke, R.F. 250 M.H., 60 M.A.
37, 123.....	Resistor, 20,000 Ohms, 2 Watts.
38, 127.....	Socket, 5 Prong Ceramic.
48, 49.....	Condenser, .004 mfd., 3000 Volts.
52, 71.....	Meter, 0-200 M.A. D.C.
62, 130, 131, 136.....	Condenser, 5 mfd., 330 Volts A.C.
66, 67.....	Condenser, .002 mfd., 6000 Volts.
68, 85.....	Condenser, .001 mfd., 5000 Volts.
73, 74, 77.....	Condenser, .005 mfd., 1200 Volts.
88, 89, 90, 91.....	Dial, Tuning.
92, 144, 145, 146, 225.....	Knob, Skirt Type.
118, 119.....	Condenser, 4 mfd., 1000 Volts.
122, 124.....	Condenser, 4 mfd., 600 Volts.
214, 221.....	Attenuator, L Pad.
10T, 11T.....	Tube, R.C.A. 866. (Sig.C.VT-46-A).
24T, 138T, 139T, 140T, 141T.....	Tube, R.C.A. 59.
133T, 134T.....	Tube, R.C.A. 45 (Sig. C. VT-45).

LIST OF SPARE PARTS

To be Used for Replacement or Repair on Item No.	Quantity	Description
1, 2, 7, 8, 109, 110, 112, 113, 201, 202	100	Fuse, 6 Amps., 250 Volts.
3	1	Transformer, Filament,
4	1	Transformer, Filament.
5	1	Coil for Time Delay Relay.
	2	Blocks of Contacts.
6	1	Coil for Plate Start Relay, 690 Ohms, Type 54L15.
	2 sets	Contacts.
14, 15	1	Condenser, Filter, 4 mfd., 1500 Volts.
16, 17, 18	2	Resistor, 900 Ohms, 115 Watts.
19	1	Resistor, 1500 Ohms, 115 Watts.
20, 21	1	Resistor, 1750 Ohms, 80 Watts.
23	1	Resistor, 250,000 Ohms, 2 Watts.
25, 39, 42, 61	2	Resistor, 400 Ohms, 25 Watts.
26, 40, 57, 59, 60	3	Condenser, .05 mfd., 600 Volts.
27, 28	1	Resistor, 15,000 Ohms, 10 Watts.
29, 32, 46, 51, 80, 81, 82	4	Condenser, .03 mfd., 1200 Volts.
33	1	Meter, 0-100 M.A. D.C.
34, 53, 72	2	Condenser, .01 mfd., 1000 Volts Test.
35	1	Condenser, .001 mfd., 1200 Volts.
37, 123	1	Resistor, 20,000 Ohms, 2 Watts.
41	1	Resistor, 10,000 Ohms, 25 Watts.
43	1	Coil for Keying Relay, 1300 Ohms.
	2 sets	Contacts.
44	1	Resistor 200 Ohms., 25 Watts.
48, 49	1	Condenser, .004 mfd., 3000 Volts.
52, 71	1	Meter, 0-200 M.A. D.C.
54	1	Condenser, .002 Mfd., 1200 Volts.
56	1	Resistor, 2000 Ohms, 25 Watts.
62, 130, 131, 136	2	Condenser, 5 mfd., 330 Volts, A.C.
65	1	Condenser, .01 mfd., 2500 Volts.
66, 67	1	Condenser, .002 mfd., 6000 Volts.
68, 85	1	Condenser, .001 mfd., 5000 Volts.
69	1	Condenser, .0005 mfd., 5000 Volts.
73, 74, 77	2	Condenser, .005 mfd., 1200 Volts.
75	1	Condenser, .003 mfd., 1200 Volts.
76	1	Condenser, .004 mfd., 1200 Volts.
78	1	Condenser, .008 mfd., 1200 Volts.
79	1	Condenser, .01 mfd., 1200 Volts.
84	1	Ammeter, 0-2.5 Amps. R.F.
87	1	Resistor, .1 megohm, 2 Watts.

To be Used for Replacement or Repair on Item No.	Quantity	Description
101, 102	20	Fuse, 10 Amps., 250 Volts.
104	1	Coil for Power Control Relay, 690 Ohms, Type 54L15.
	2 sets	Contacts.
108	1	Voltmeter, 0-150 Volts A.C.
111	1	Transformer, Filament.
118, 119	1	Condenser, 4 mfd., 1000 Volts...
120	1	Resistor, 800 Ohms, 45 Watts.
121	1	Resistor, 15,000 Ohms, 33 Watts.
122, 124	1	Condenser, 4 mfd., 600 Volts.
128	1	Resistor, 50,000 Ohms, 2 Watts.
129	1	Resistor, 2,500 Ohms, 2 Watts.
135	1	Resistor, 800 Ohms, 25 Watts.
207	1	Condenser, 500 mfd., 50 Volts.
209	1	Resistor, 400 Ohms, 10 Watts.
210	1	Resistor, 300 Ohms, 10 Watts.
211	1	Resistor, 100 Ohms, 10 Watts.
213	1	Condenser, 1 mfd., 400 Volts.
218	1	Coil for Microphone Relay, 20 Ohms.
	2 sets	Contacts.
219	1	Condenser, 4 mfd., 600 Volts.
10T, 11T	2	Tube, No. 866.
24T, 138T, 139T, 140T, 141T...	5	Tube, No. 59.
38T	1	Tube, No. 807.
58T	1	Tube, No. 830-B.
115T	1	Tube, No. 83.
127T	1	Tube, No. 56.
133T, 134T	2	Tube, No. 45.
208T	6	6.3 Volt, .15 Amps., Pilot Lamp.
220T	1	Neon Bulb.

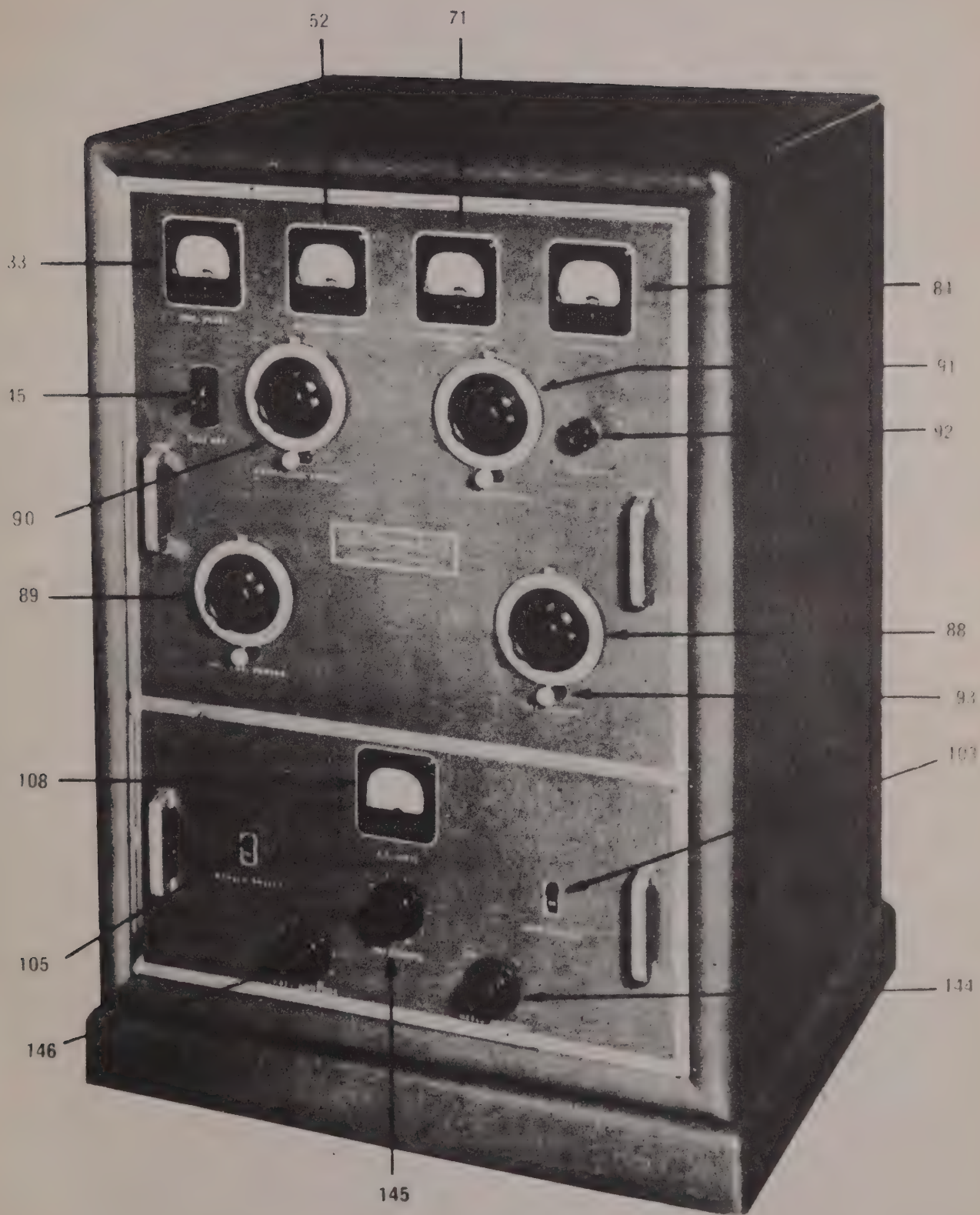


FIG. 1. RADIO TRANSMITTER BC-329-A, FRONT VIEW

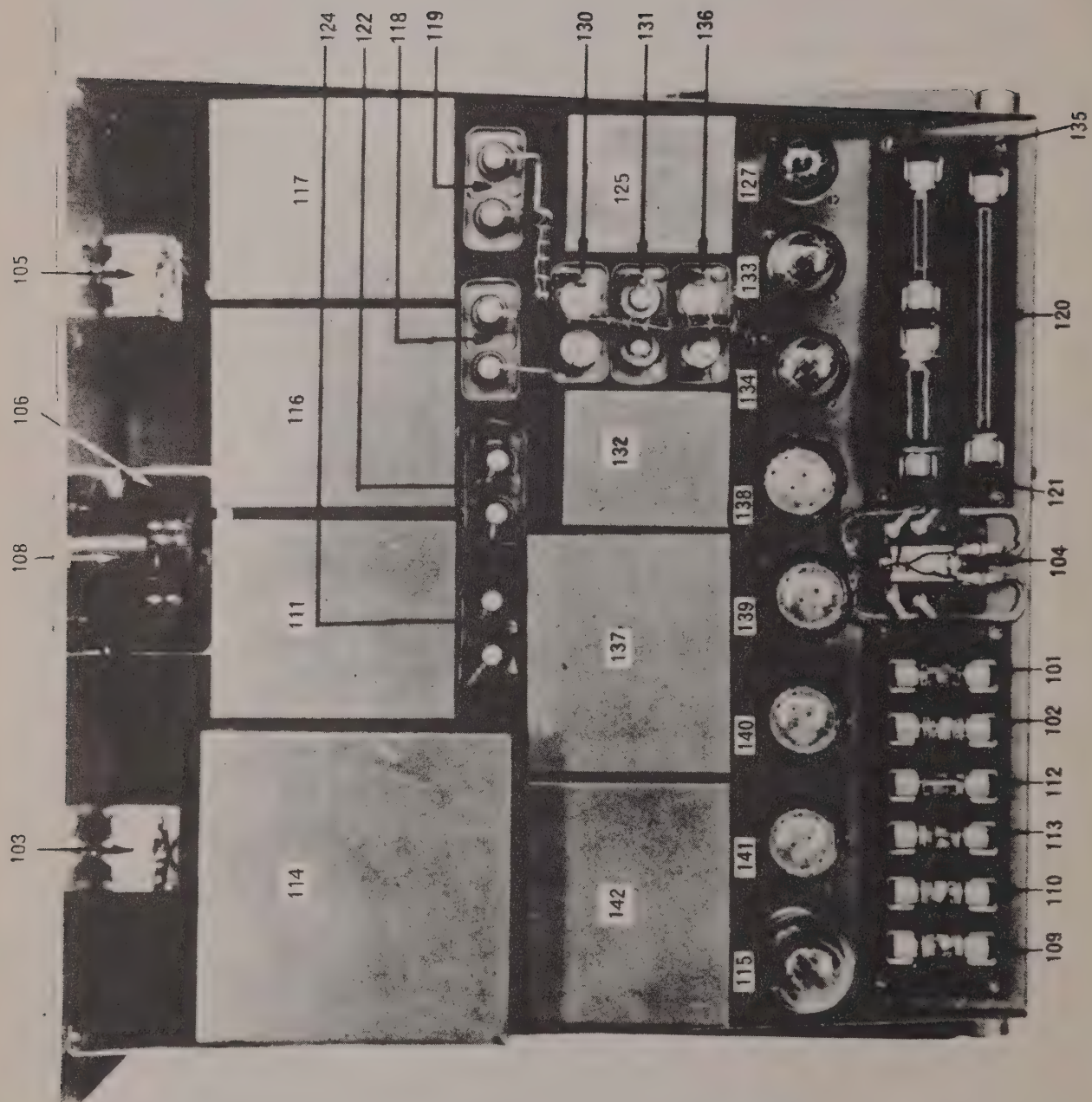


FIG. 2. RADIO TRANSMITTER BC-329-A, AUDIO FREQUENCY UNIT, TOP VIEW

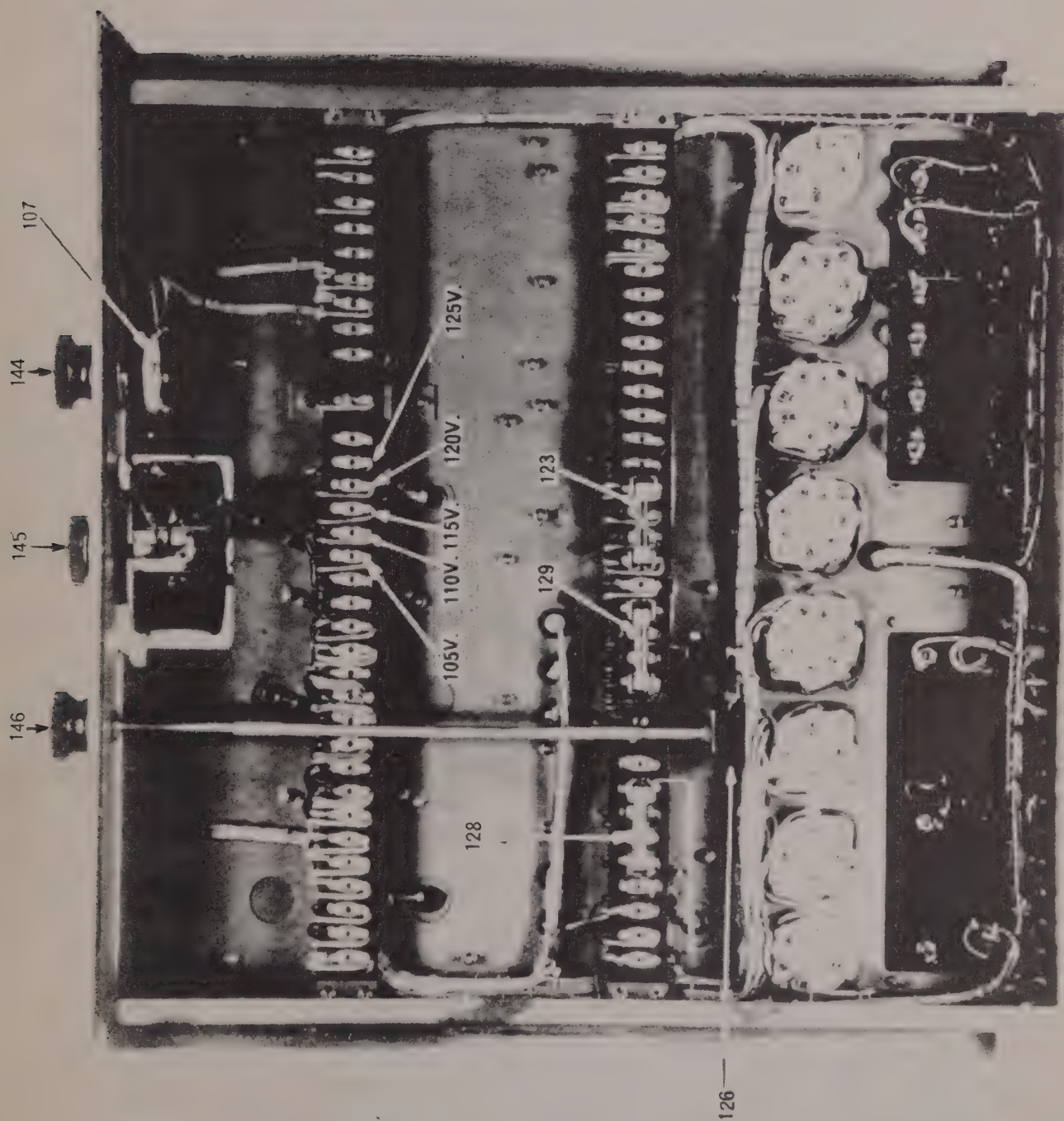


FIG. 3. RADIO TRANSMITTER BC-329-A, AUDIO FREQUENCY UNIT, BOTTOM VIEW

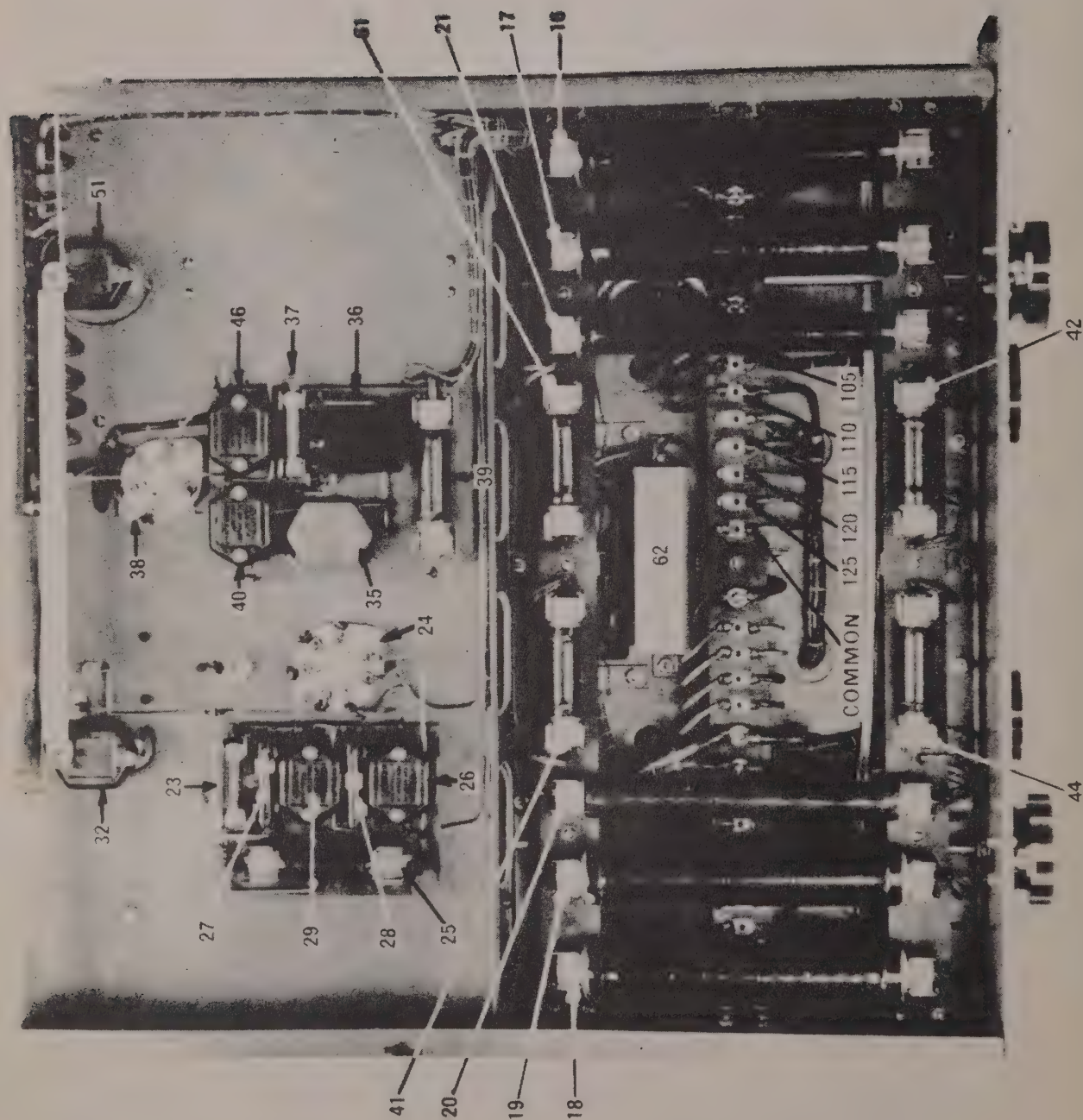


FIG. 4. RADIO TRANSMITTER BC-329-A, RADIO FREQUENCY UNIT, BOTTOM VIEW

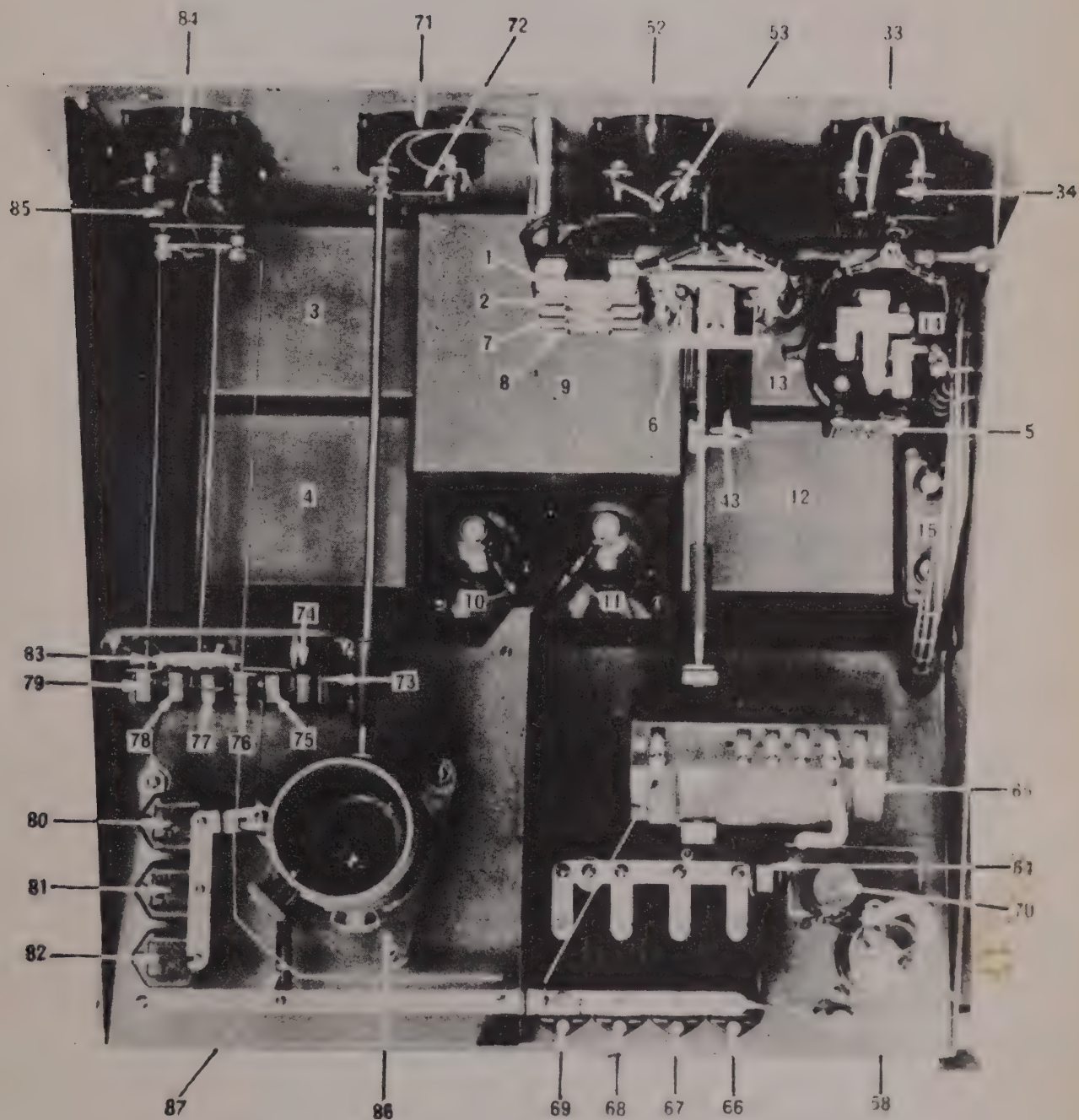


FIG. 5. RADIO TRANSMITTER BC-329-A, RADIO FREQUENCY UNIT, TOP VIEW

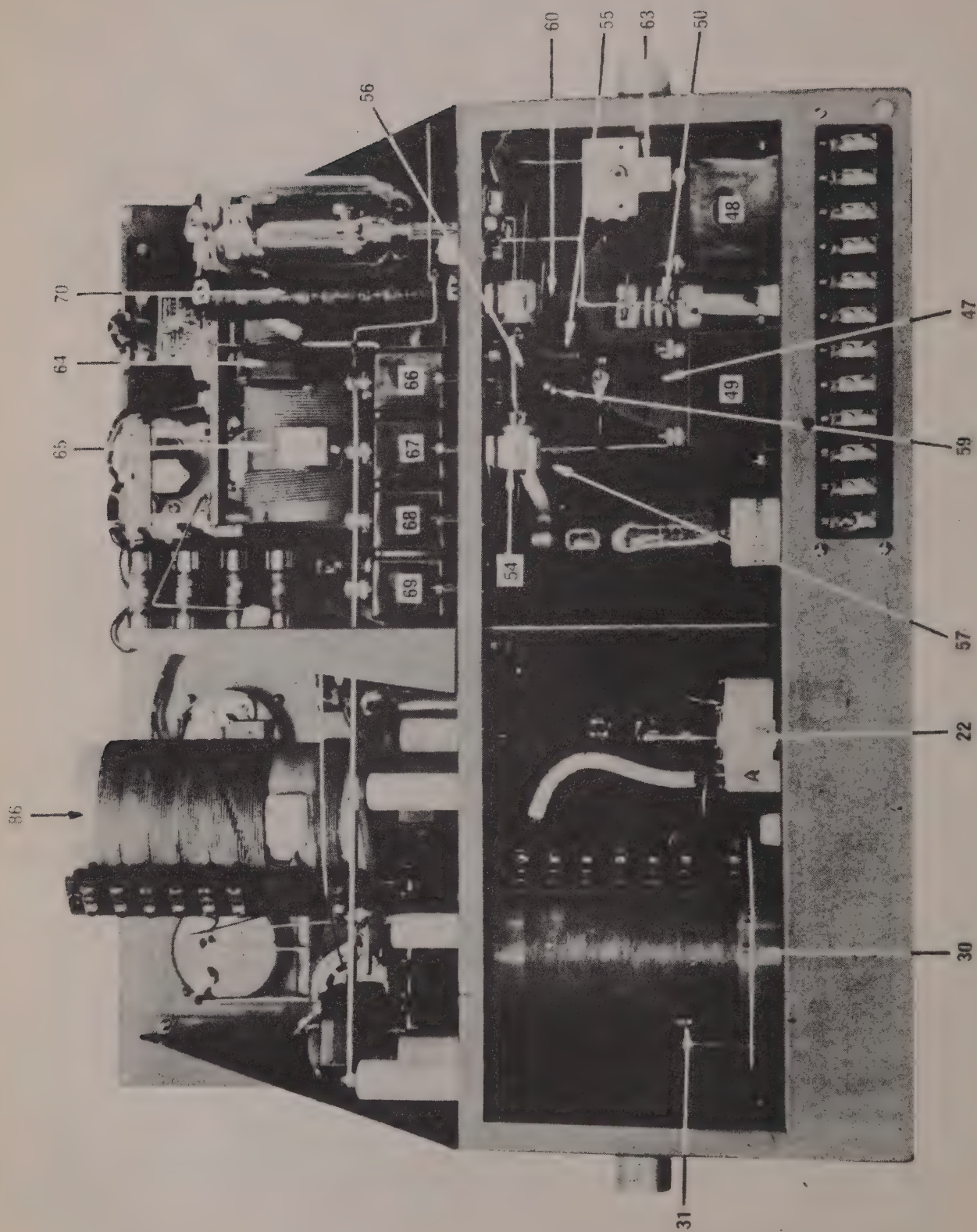


FIG. 6. RADIO TRANSMITTER BC-329-A, RADIO FREQUENCY UNIT, REAR VIEW

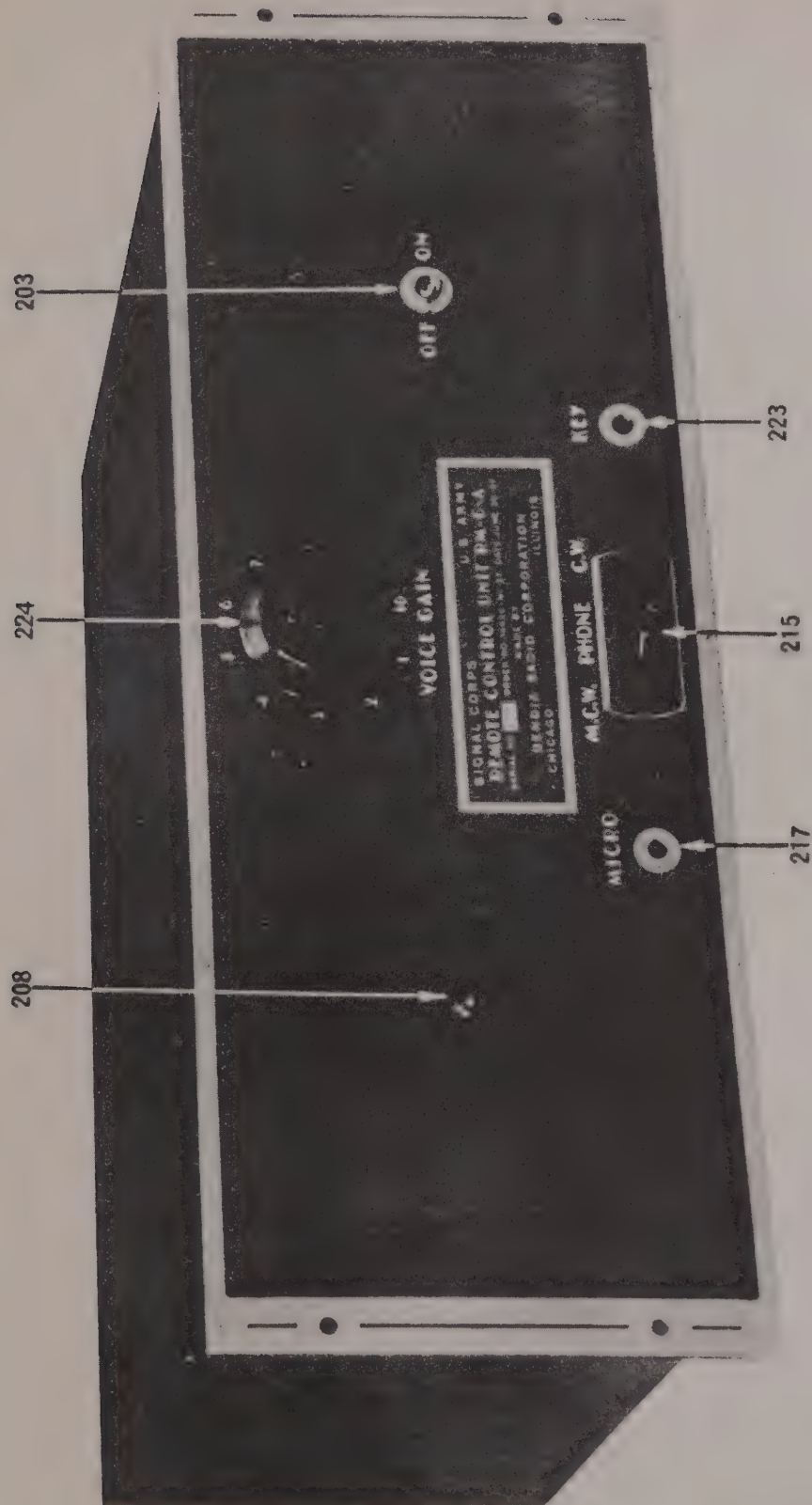


FIG. 7. REMOTE CONTROL UNIT RM-6-A, FRONT VIEW

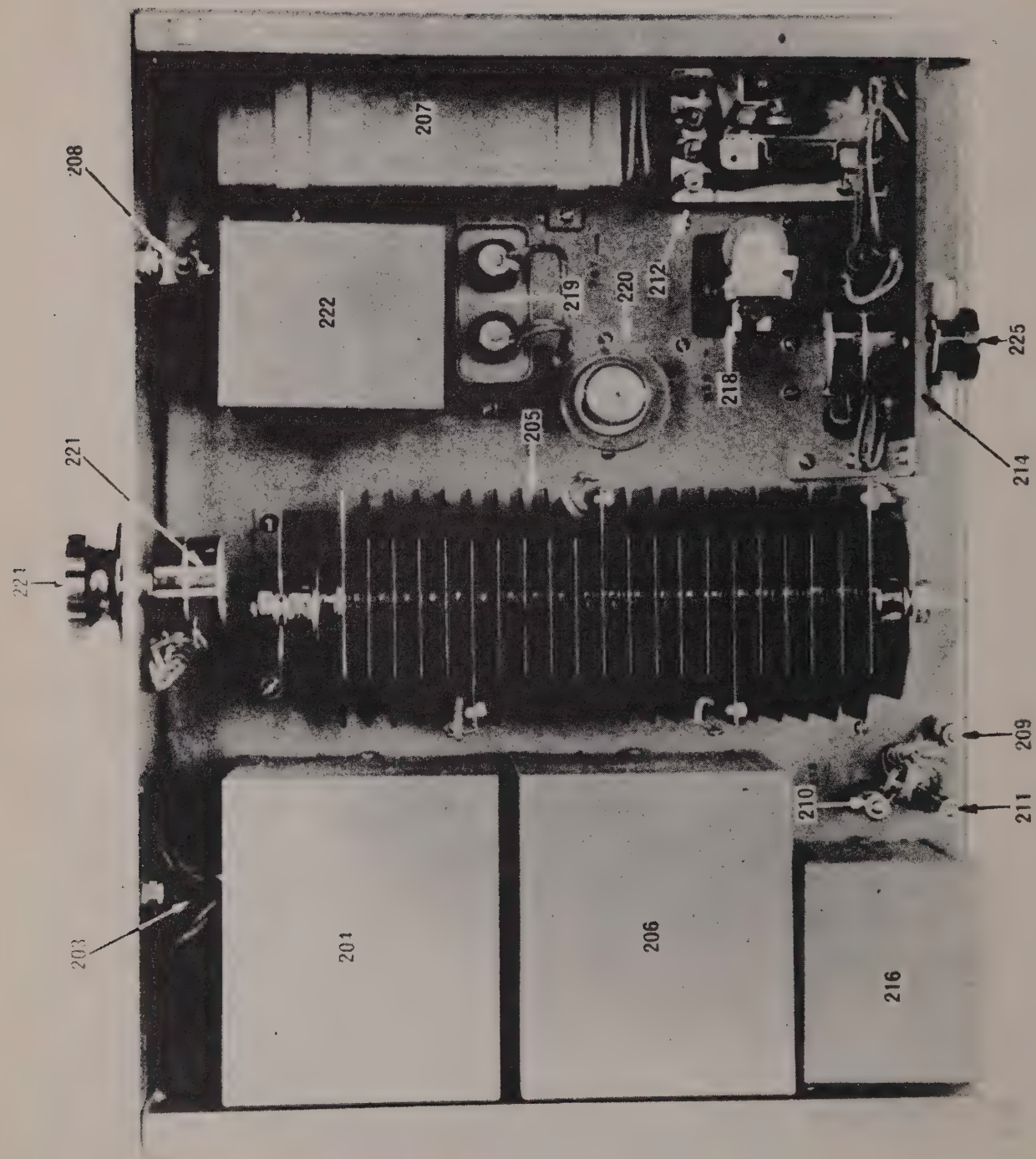


FIG. 8. REMOTE CONTROL UNIT RM-6-A. TOP VIEW

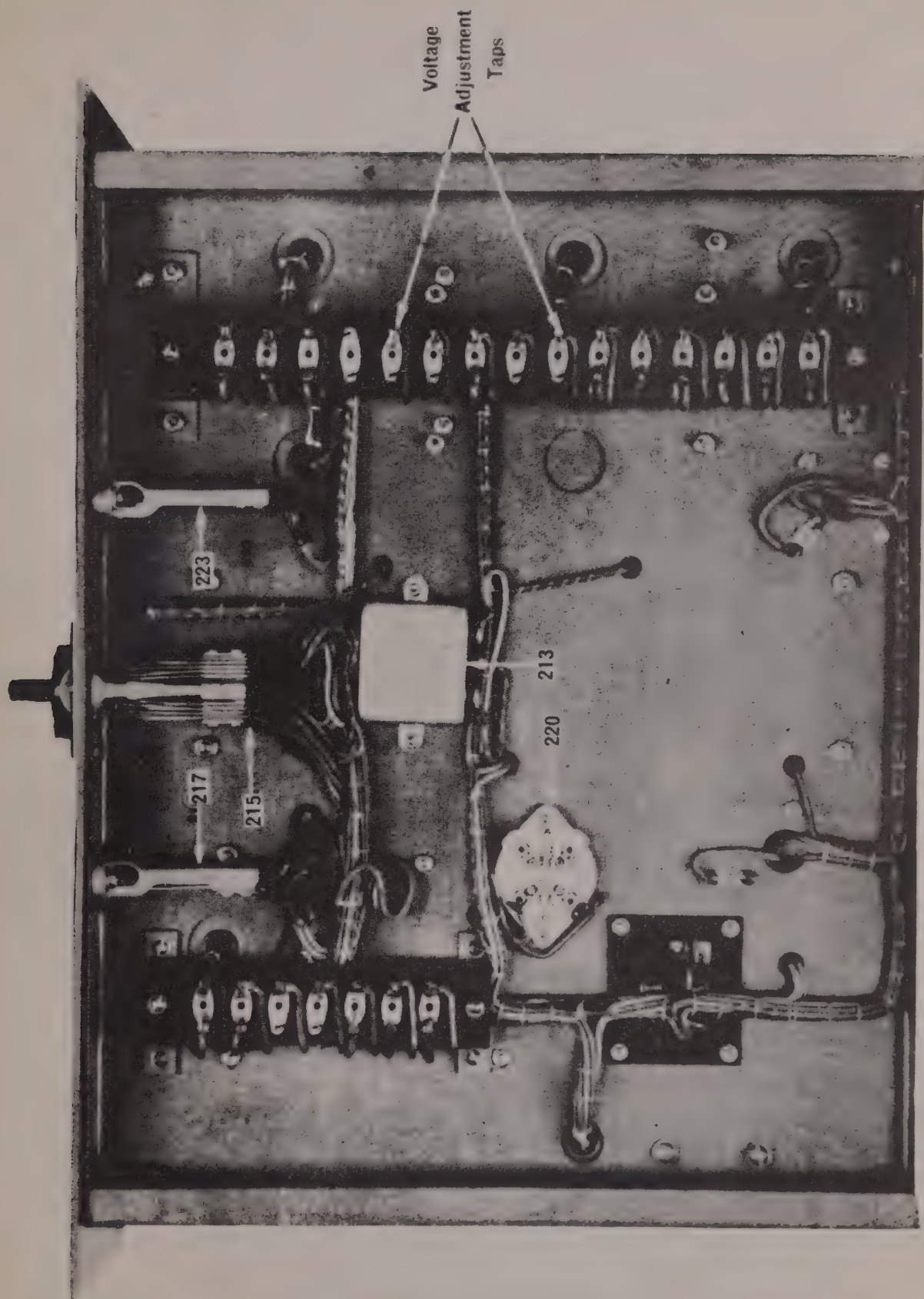


FIG. 9. REMOTE CONTROL UNIT RM-6-A, BOTTOM VIEW

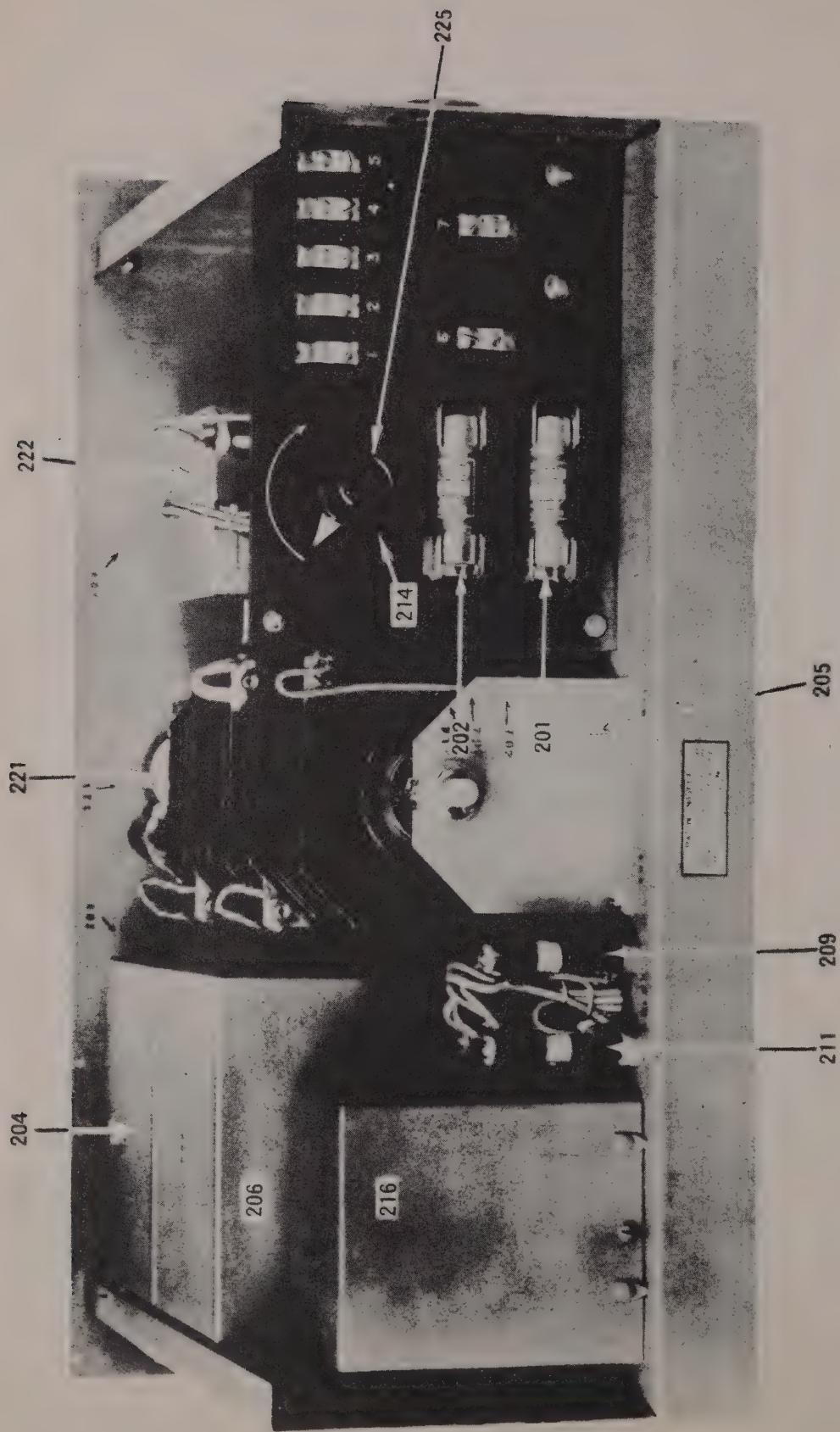


FIG. 10. REMOTE CONTROL UNIT RM-6-A, REAR VIEW

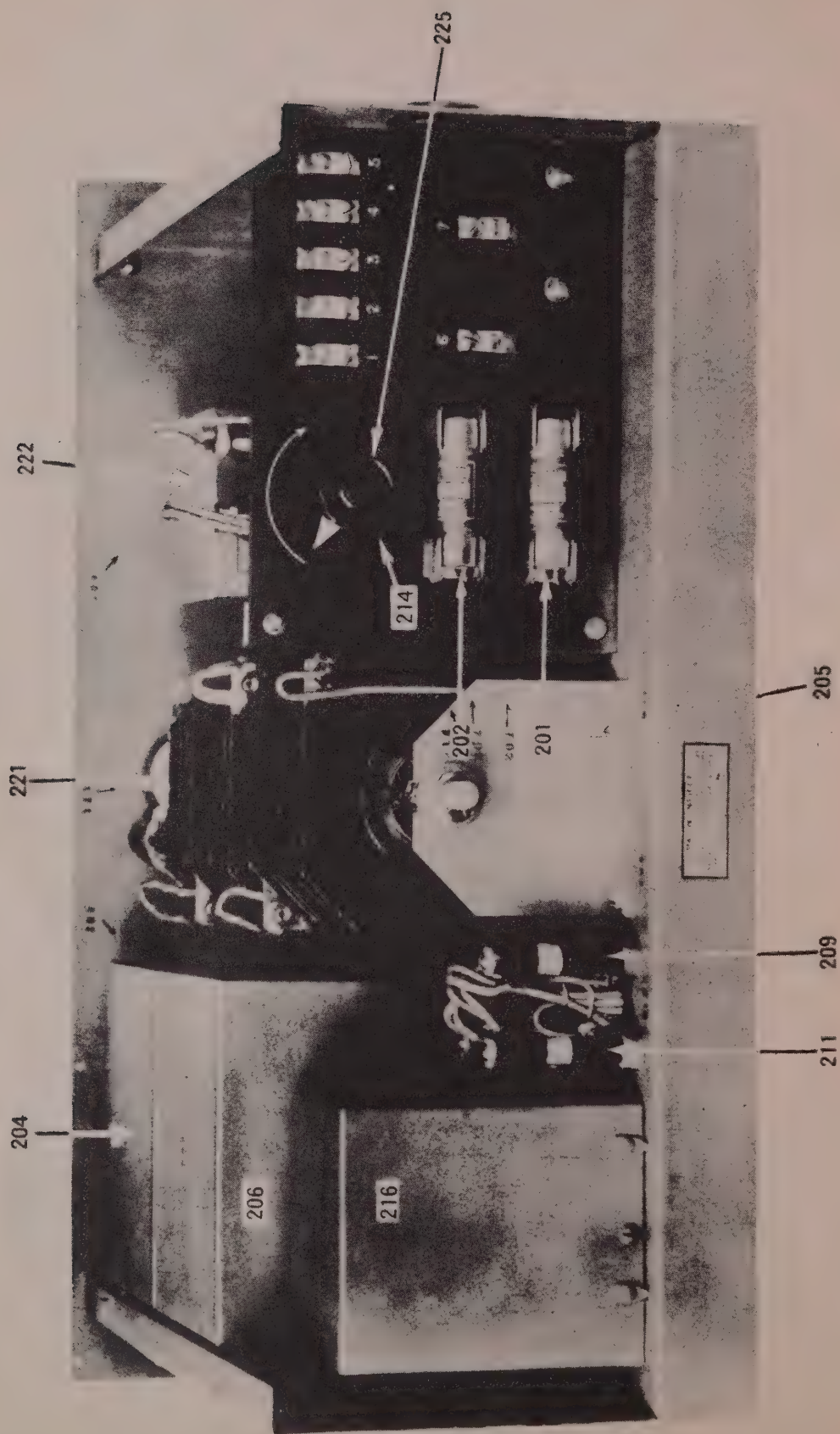


FIG. 10. REMOTE CONTROL UNIT RM-6-A, REAR VIEW

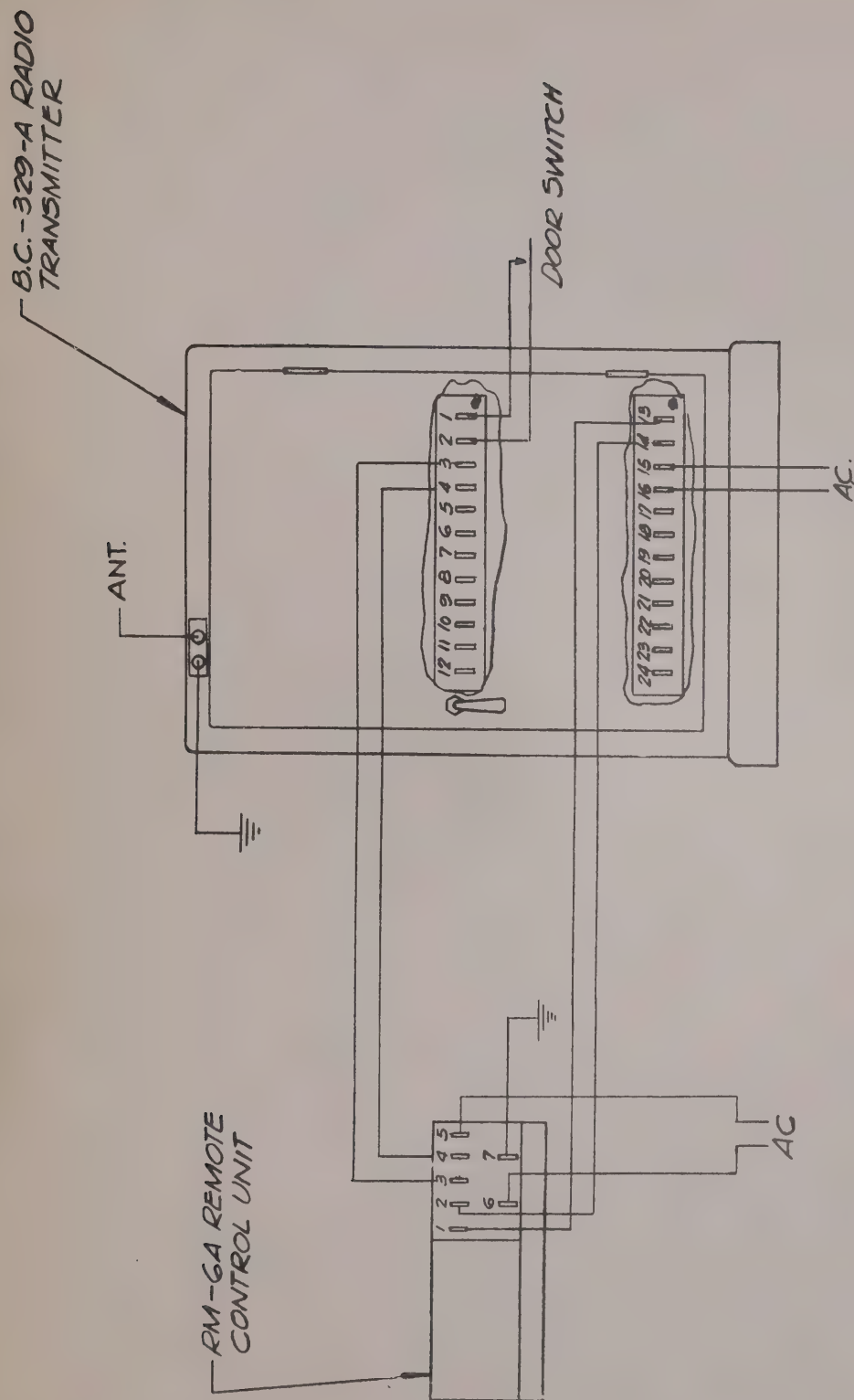


FIG. 12. REMOTE CONTROL UNIT RM-6-A
TO RADIO TRANSMITTER BC-329-A, WIRING DIAGRAM



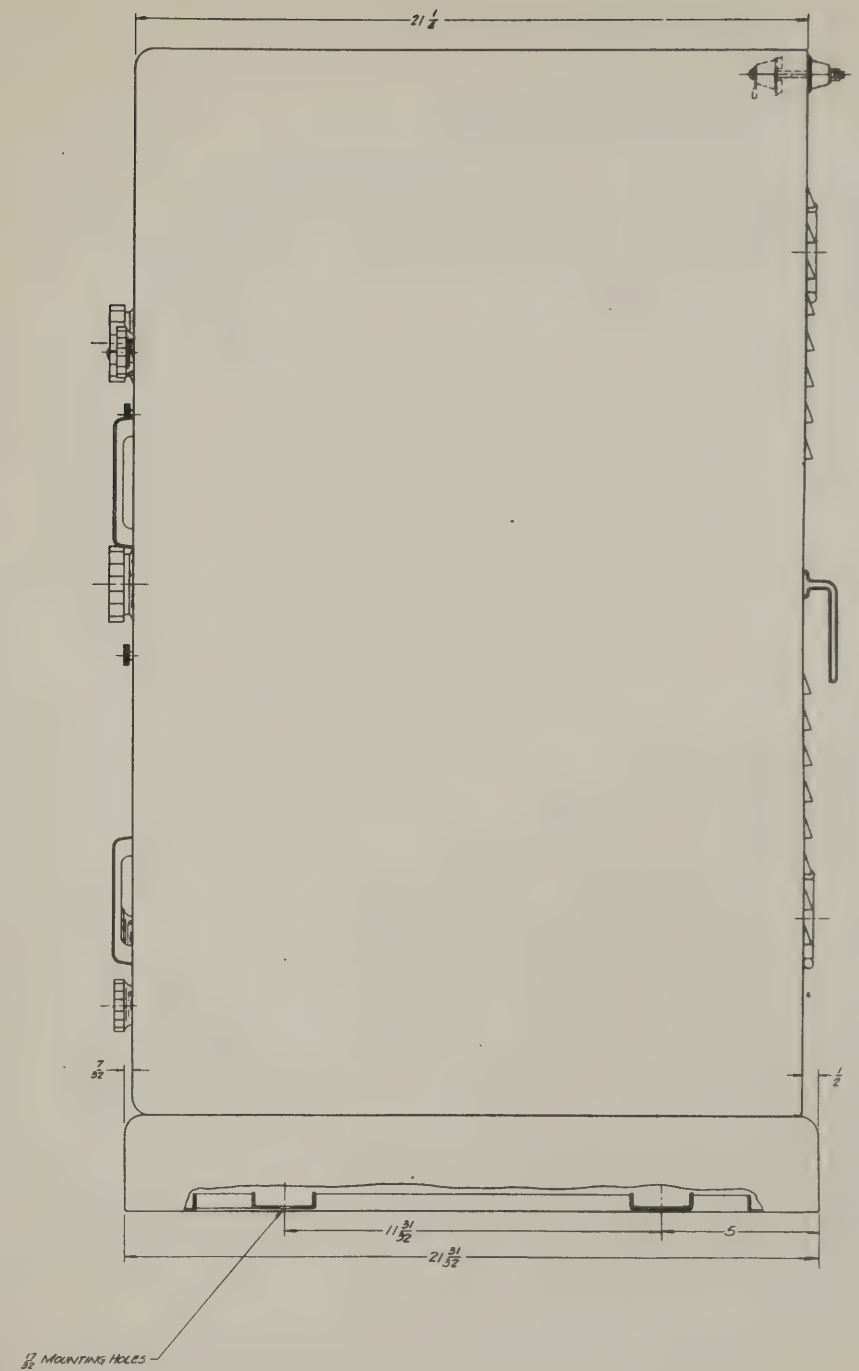
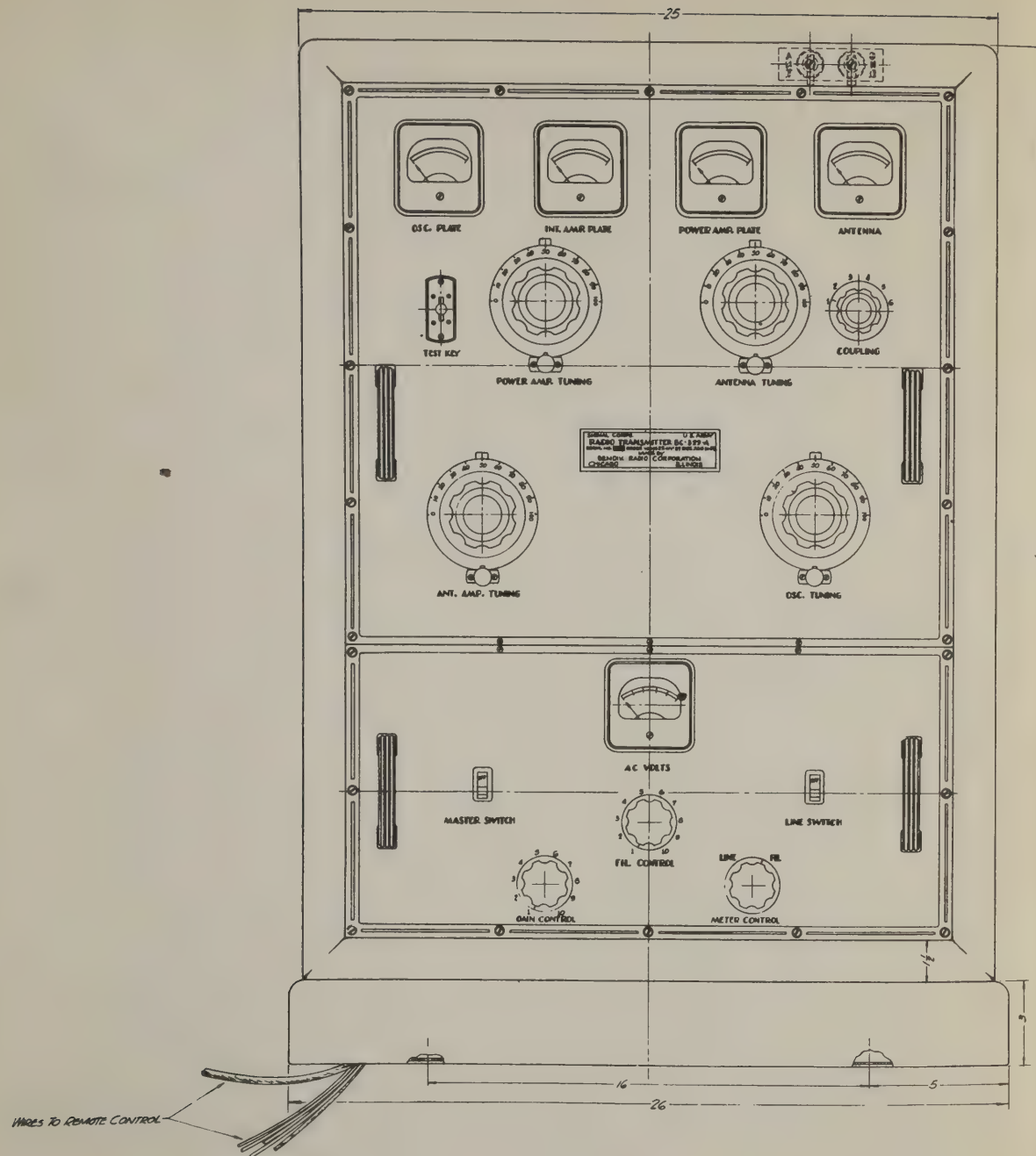


FIG. 13. RADIO TRANSMITTER BC-329-A,
ASSEMBLY AND DIMENSIONAL OUTLINE

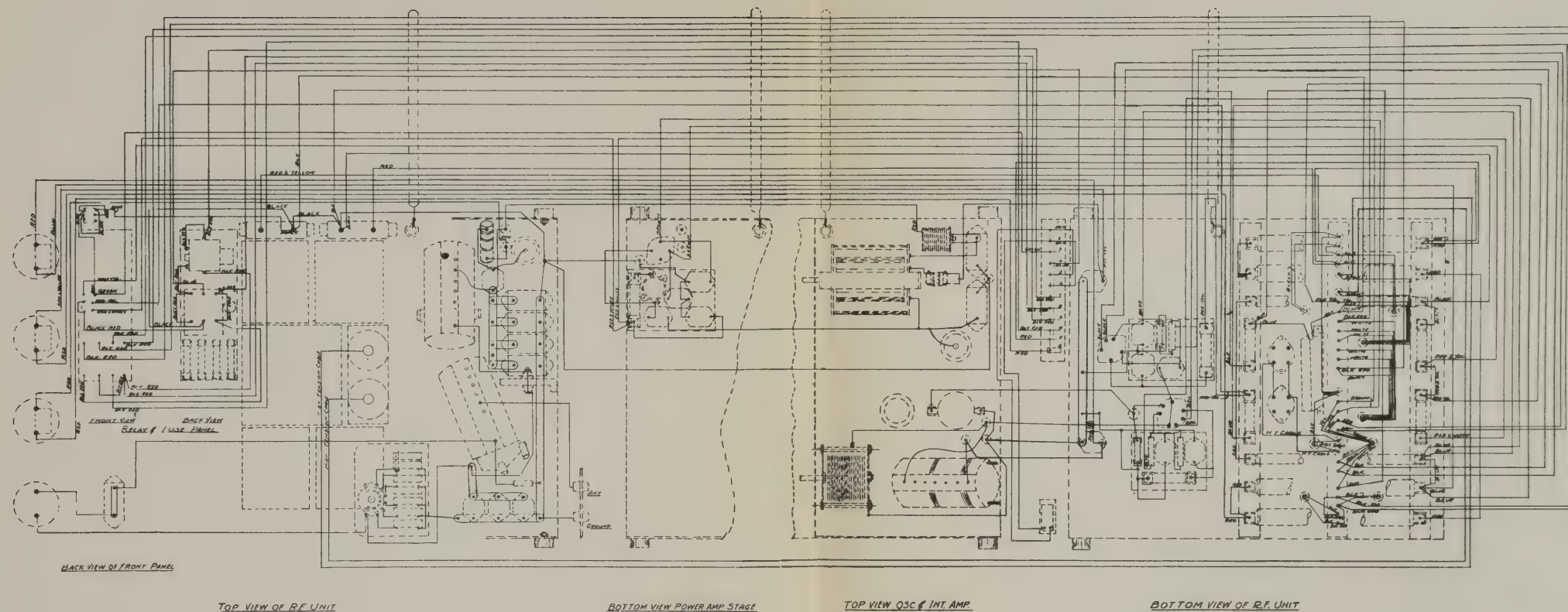


FIG. 14. RADIO TRANSMITTER BC-329-A, R.F. UNIT,
WIRING DIAGRAM

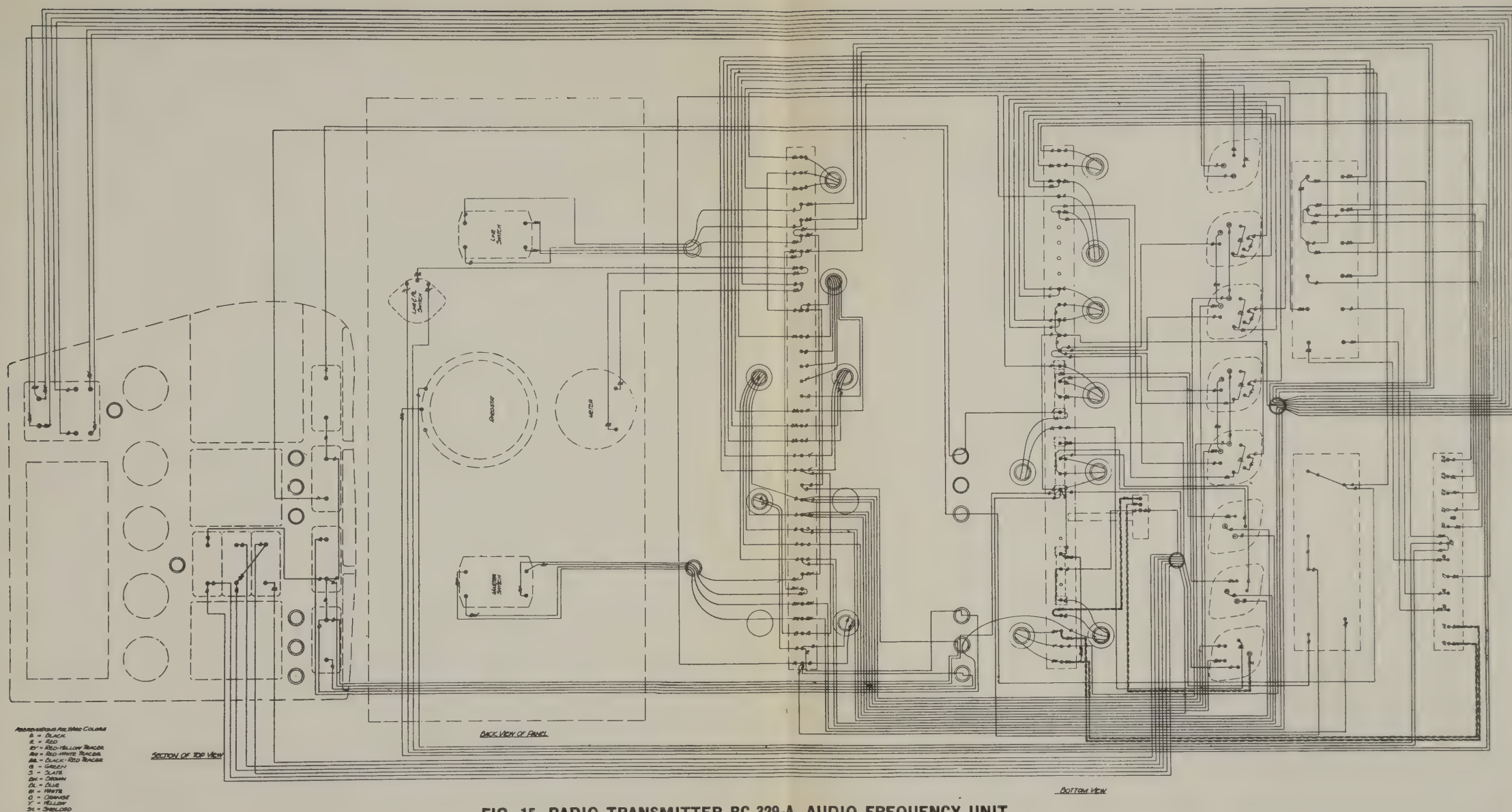
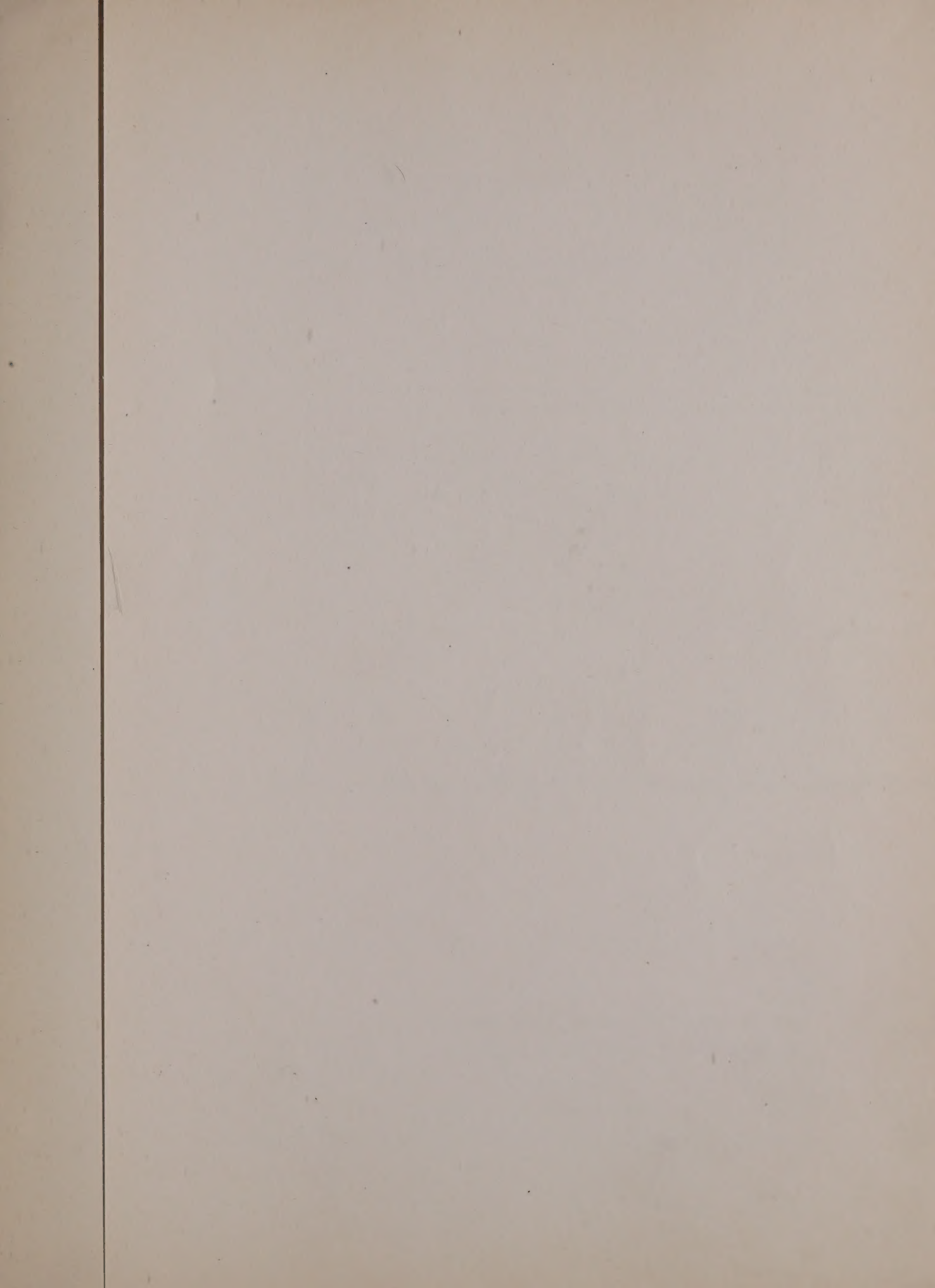


FIG. 15. RADIO TRANSMITTER BC-329-A, AUDIO FREQUENCY UNIT,
WIRING DIAGRAM



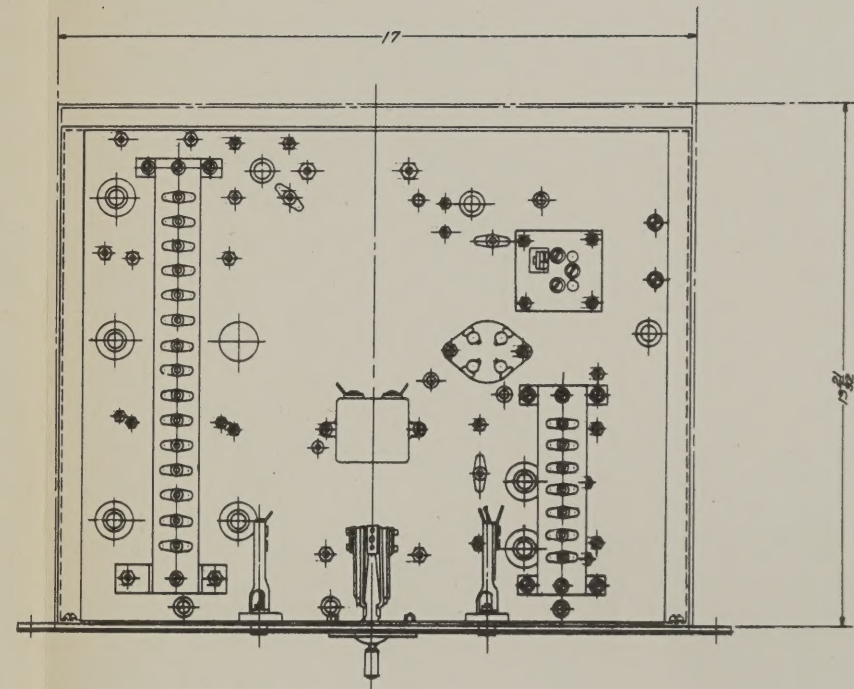
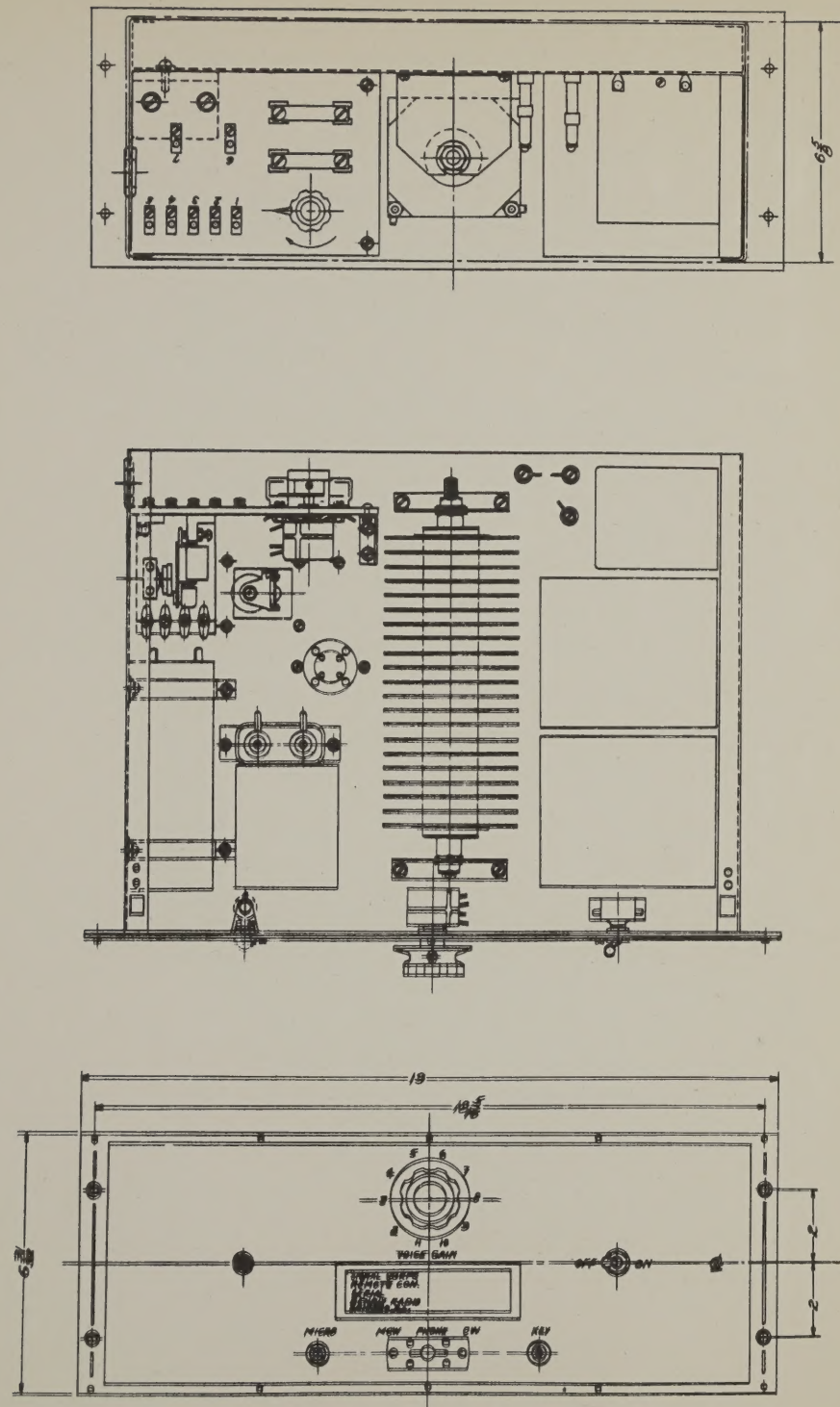


FIG. 18. REMOTE CONTROL UNIT RM-8-A,
ASSEMBLY AND DIMENSIONAL OUTLINE

